



**OCEAN
SAILING**





**YACHT HAND
AND
YACHT SKIPPER
TRAINING
MANUAL**



This Manual has been designed and written to cover the curriculum for the CASA/RYA 'Yachthand' and 'Yacht Skipper' Course only, covering the theoretical requirements. (The practical training takes place at sea and is linked with this programme).



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You will discover, that by combining theory with practice and the use of our very sophisticated training aids which we have developed since we began in 1979, you will make rapid progress, which, to beginners, might appear to be a daunting challenge!

Never fear; with the very personalised tuition you will receive by my trained and professional staff, it will all make sense.

Libby and I welcome you on board, and should you have any problems or queries, please consult us.

Enjoy your sailing and your stay!

Sincerely

A handwritten signature in blue ink, appearing to read 'Chris Bonnet', with a stylized flourish at the end.

CHRIS BONNET

PRINCIPAL



YACHT HAND AND YACHT SKIPPER (LOCAL WATERS)

TRAINING MANUAL

YACHT HAND SECTION (PAGE 1 - 77)

	<u>PAGE NO</u>
Introduction	
CASA Curriculum	1 - 5
Yacht Rigs	6
The Basic Yacht	7 - 17
Parts of a Boat	
Parts of a Sail	
Mast, spars fittings & rigging	
Sailing Terms	
Theory of Sailing	18 - 19
Points of Sailing	21 - 22
Tacking and Gybing	23
Basic Meteorology	24 - 27
Ropes and Basic Knots	28 - 30
Collision Regulations	31 - 38
Anchoring & Mooring	39 - 44
Man Overboard Route	45 - 46
Safety Equipment	47 - 48
Distress Signals	49 - 51
VHF Radio	51 - 53
Flags	54 - 57
First Aid	58 - 62
Navigation: Yacht Hand level	63 - 77
Latitude and longitude	
Mercator Projection	
Variation and deviation	
Position/Direction/Bearing	

YACHT SKIPPER SECTION (PAGE 78 - 118)

General Definitions	79
Harbour Regulations	80
Durban List of lights	81
Lights	82 - 83
Daylight Shapes	84
IALA Buoyage System	85
Coastal Navigation: Yacht Skipper Level	86 - 107
Tides	
Running Fix	
Bobbing the lights	
Horizontal Sextant Angle	
Aids to Navigation	108 - 110
Logs	
Depth Sounder	
Radio Direction Finder	
Radar	
Abandon Ship Routine	111
Fog and Heavy Weather	112
Marine Sound Signals	113
Passage Planning	114
Spinnakers	115 - 117
References	118



PART ONE

INTRODUCTION

Master of this ship under God

'-the Captain's mantle - that almost visible aura of responsibility that surrounds the Master of any boat, irrespective of his character or nature. It is an inescapable burden, a price to be paid without haggling or bargaining. The Sea takes no heed of truth or falsehood; honesty and chicanery are as one to it, and no exercise of these qualities will distract it or deflect its blows. A Captain, be he saint or sinner, must pay the inexorable fee in the only currencies that the sea honours - duty, vigilance, skill and endurance.'

'No Skipper, be his boat large or small, notes with pleasure a falling barometer, a brassy sunset, a big swell and the prospect of what may follow. Engines can fail, rudders carry away, freak seas smash down - things to be neither foreseen nor forestalled. Might not this same gale now portending be the legendary Masterwind - the Wrath of God that would some day rage to rip plank from timber, breath from body, and lash the very oceans from their beds to drown all the lands?'

Sea Hunters



OVERALL SCHEME OF CRUISING COURSES AND QUALIFICATIONS

Grade	Shorebased Course	Practical Course	Seatime	Examination
Yacht Hand	Combined course for both grades seamanship and navigation	5 days Mainly seamanship and sailing	Experience gained during course	Completion certificates awarded on satisfactory completion of courses
Yacht Skipper (Local Waters)		5 days Seamanship, sailing and navigation	50 hours 200 miles 8 night hours	Yes
Coastal Skipper	Combined course for both grades navigation and meteorology	5 days Combined course for both grades, practical skippering	15 days miles night hours	Yes
Yachtmaster Offshore			50 days 2,500 miles 5 passages over 60 miles 2 as skipper and 2 overnight passages	Yes. The sea-phase will be dispensed with for holders of the Coastal Skippers Certificate.
Yachtmaster Ocean	Astro navigation and world-wide meteorology	None		Written examination Open only to Yachtmasters Offshore

PLEASE NOTE THE ALTERATIONS AS FROM 31 AUGUST 1993 WHICH ARE LISTED FOR YOU ON THE FOLLOWING PAGE.

YACHT HAND AND YACHT SKIPPER (LOCAL WATERS)

The syllabi for these two courses are set out by the Cruising Association of South Africa (CASA). Ocean Sailing Academy conducts the courses for 5 consecutive days or 2 consecutive weekends. A course completion certificate recognised by the CASA is awarded to each student who achieves a satisfactory level of competence at the end of each course.

TRAINING CURRICULUM FOR THE YACHT HAND PRACTICAL COURSE

Course Objectives : On satisfactory completion of the course the student will have a working knowledge of sea terms and nautical terminology sufficient to understand orders given concerning the sailing and day to day running of a yacht and be able to:

1. Rig and work the sails using the appropriate equipment correctly.
2. Handle correctly the ropes in general use aboard, make the commonly used knots, simple splices, and whippings.
3. Understand the purpose of personal safety equipment and use it correctly.
4. Understand the action to be taken to recover man overboard.
5. Operate distress flares and know on what occasions they should be used.

CRUISING ASSOCIATION OF SOUTH AFRICA

TO WHOM IT MAY CONCERN

CHANGES TO QUALIFICATIONS FOR SKIPPER'S CERTIFICATES

At a National Examiner's Seminar held in Cape Town on 9th May, 1992 certain changes to the qualifications required for Coastal Skipper and Yachtmaster offshore Certificates of Competence were discussed and proposed to Council, which met on 13th June 1992.

1. The following proposals were adopted by Council, with effect from 1st October 1992:
 - 1.1 that the experience required for Coastal Skipper be increased to:
 - 1.1.1 15 days on board as skipper or watch captain with 800 miles logged in tidal waters in the open sea,
 - 1.1.2 at least three passages of 60 miles or more
 - 1.1.3 48 hours night watchkeeping
 - 1.1.4 periods on board in excess of 12 hours, but not less than 24 hours may be counted as a day. At least 8 full periods of 24 hours must be included.
 - 1.2 that the experience required for Yachtmaster Offshore be increased to:
 - 1.2.1 30 days living on board a yacht in commission (a day being defined as 24 hours living aboard), of which 50% must be at sea under way
 - 1.2.2 2500 miles in total as minimum
 - 1.2.3 48 hours night watchkeeping
 - 1.2.4 a minimum of three passages of not less than 100 miles non-stop as skipper. All of these to be overnight passages.
2. It was further agreed by Council that, with effect from 1st October 1992:
 - 2.1 candidates for Yachtmaster Offshore Certificates must first qualify for the Coastal Skipper Certificate.
 - 2.2 it was however agreed that, at the examiner's entire discretion, an exceptional candidate may be upgraded by the examiner if the candidate was informed early during the examination that the examination will be conducted at the higher level.
 - 2.3 a candidate who did not quite pass the examination for Coastal Skipper may, at the examiner's entire discretion be awarded a Local Waters Certificate.
3. The following proposals were adopted by Council at their meeting in June 1993:
 - 3.1 Coastal Skipper has been limited to within 50 miles of the coastline,
 - 3.2 Yachtmaster Offshore has been extended to include a mastery of electronic position fixing devices,
 - 3.3 The 2 hour Celestial Navigation examination for Yachtmaster Ocean may, at the candidate's request, be replaced by him presenting a suitable documentary evidence of Practical Celestial Navigation, done within the previous twelve months. Please discuss this with the secretariat.

This note is issued to be inserted into the Yachtman's Logbook and for the guidance of examiners and sailing schools.

ERIC WELLS
ADMINISTRATIVE MANAGER

31 August 1993

6. Understand the ordinary practice of seamen and yachtsmen with regard to burgees and ensigns, prevention of unnecessary noise and disturbance in harbour, including courtesies to other craft berthed alongside.
7. Keep an efficient lookout and understand the sailing rules.
8. Handle a dinghy under oars or engine and comply with safe loading rules.
9. Understand a weather forecast, be aware of forecasting services and have a knowledge of the Beaufort Scale.
10. Read a log and echo sounder and make entries in a log book.
11. Carry out general duties on a yacht both below and on deck including handling of anchors and associated gear, fenders, boat-hook and mooring lines.
12. Understand the theory of sailing, steer and trim sails on all points of sailing. Steer a compass course under sail and power.
13. Start, stop and carry out simple checks on the engine.

TRAINING CURRICULUM FOR THE YACHT SKIPPER (LOCAL WATERS)

PRACTICAL COURSE

Course Objectives : This is essentially a skippers' course and it is assumed that those attending are already competent helmsmen and crew members. The syllabus is intended as a guide to specific items of which the skipper of a cruising yacht must have a high standard of knowledge and ability in order to take a yacht safely to sea.

QUALIFYING EXPERIENCE

The student has been an active crew member aboard a yacht for 50 hours including 200 miles sailed in tidal or inland waters and 8 hours night watchkeeping. (Only periods of four hours or more aboard, 75 % of which has been spent sailing, may be aggregated towards the total of 50 hours).

1. **Preparation for sea**
Is able to prepare a yacht for sea, including engine checks, selection of sails securing and stowage of all gear on upper deck and below.
2. **Organisation of watch at sea and in harbour**
Can take charge of a watch at sea, by day or night and organise an anchor watch. Knows action required in reduced visibility, adverse weather conditions and in emergency situations.
3. **Deck work**
Can reef, shake out reefs and change sails to suit prevailing conditions. Can prepare an anchor, mooring warps and take charge of work on the upper deck when mooring alongside, coming to a buoy, anchoring, weighing anchor and slipping from a buoy or alongside berth. Can prepare, pass and slip a tow.

4. **Navigation and pilotage**

Is proficient in chart work, and can carry out routine navigational duties on passage, including:

Taking and plotting fixes

Working up DR and EP.

Estimation of tidal heights and tidal streams.

Working out course to steer to allow for tidal stream, leeway and drift.

Knowledge of IALA buoyage.

Maintenance of navigational records.

Use of echo sounder and lead line.

Can prepare and execute a pilotage plan for entering and leaving harbour.

Understands the use of leading and clearing lines.

Use of transits and soundings as aids to pilotage.

5. **Meteorology**

Knows sources of forecast information, can interpret shipping forecasts and use a barometer as a forecasting aid.

6. **Rules of the road**

Has a working knowledge of the International Regulations for Preventing Collisions at Sea.

7. **Maintenance and repair work**

Understands and is able to carry out maintenance tasks.

Can make eye splice in rope and common and sailmakers whippings.

Knows the properties and uses of common synthetic fibres.

8. **General organisation**

Can make out a victualling list and supervise victualling organisation afloat.

9. **Emergency situations**

Is able to take correct action as helmsman for recovery of man overboard.

Fully understands use of distress flares.

Knows correct procedure for helicopter rescue.

10. **Boat handling**

Under power, can bring a boat safely to and from an alongside berth, mooring buoy and anchor.

Under sail can bring a boat safely to and from a mooring buoy and anchor. Can steer and trim sails effectively on all points of sailing.

11. **Passage planning**

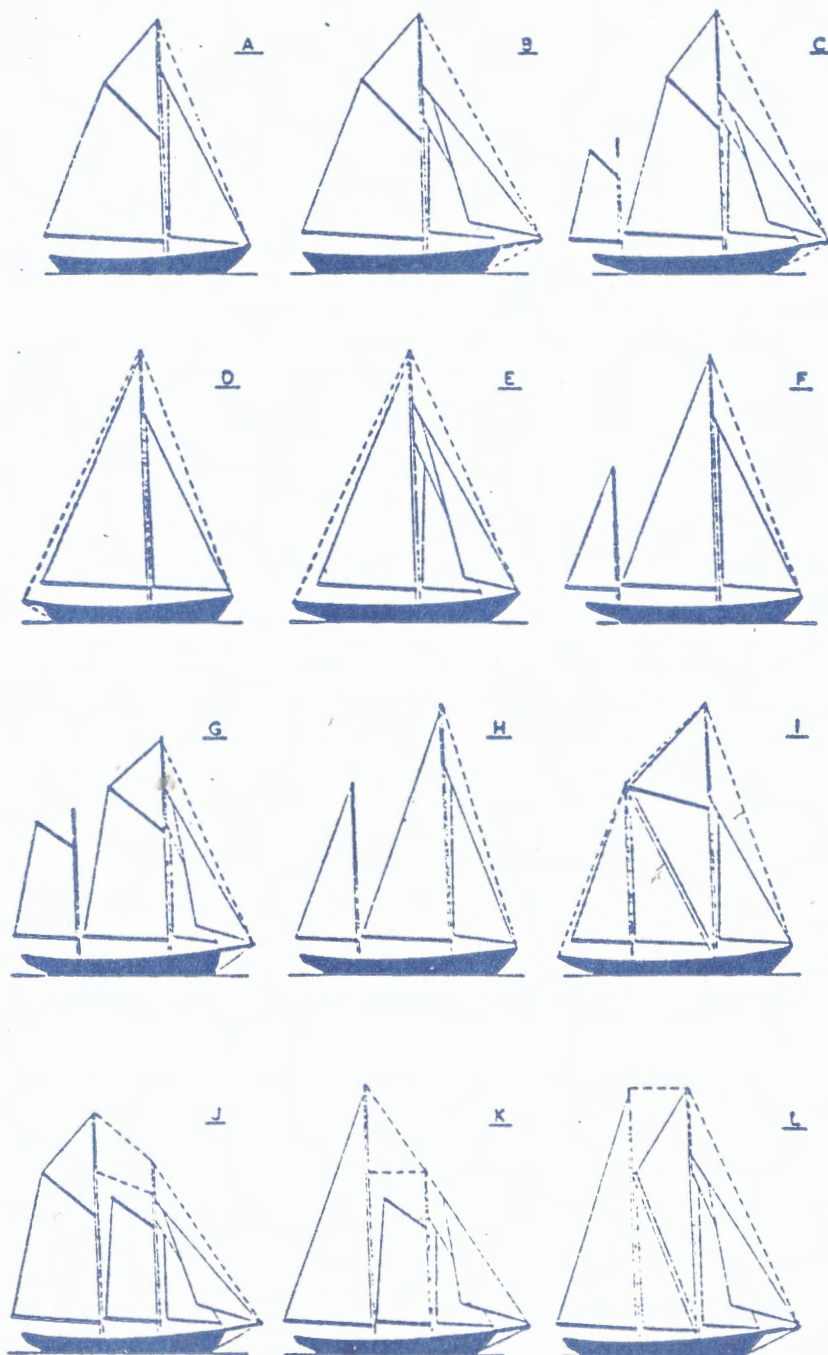
Can plan a short coastal passage, taking account of relevant navigational hazards and limitation imposed by the type of boat and the strength of the crew.

12. **Artificial resuscitation**

Has a sound knowledge of the mouth to mouth method of resuscitation.

13. **First aid**
Has a sound knowledge of first aid.
14. **Radiotelephony**
Can operate a radiotelephone in emergency and send a distress message.
15. **Watchkeeping competence**
Understands the organisation of watchkeeping and is fully competent to take charge of a watch, at sea and in harbour.

YACHT RIGS



(A) gaff sloop; (B) gaff cutter; (C) gaff yawl; (D) bermudian sloop; (E) bermudian cutter;
 (F) bermudian yawl; (G) gaff ketch; (H) bermudian ketch; (I) wishbone ketch; (J) gaff
 schooner; (K) schooner with bermudian mainsail and gaff foresail; (L) staysail schooner.

THE BASIC YACHT

Every sailing boat has four basic parts :

A hull, keel, rudder and sails. Each has a role to play in keeping the boat afloat, stable and moving in the right direction. The way in which each part affects the working of the other parts determines the character of the boat.

1. THE HULL

- Provides a rigid structure to support the mast and sails.
- Designed to enable the boat to move easily through water both upright or heeled over.

2. THE RUDDER

- Controls the direction.
- Provides resistance to sideways movement.
- Only effective if the boat is moving through the water.

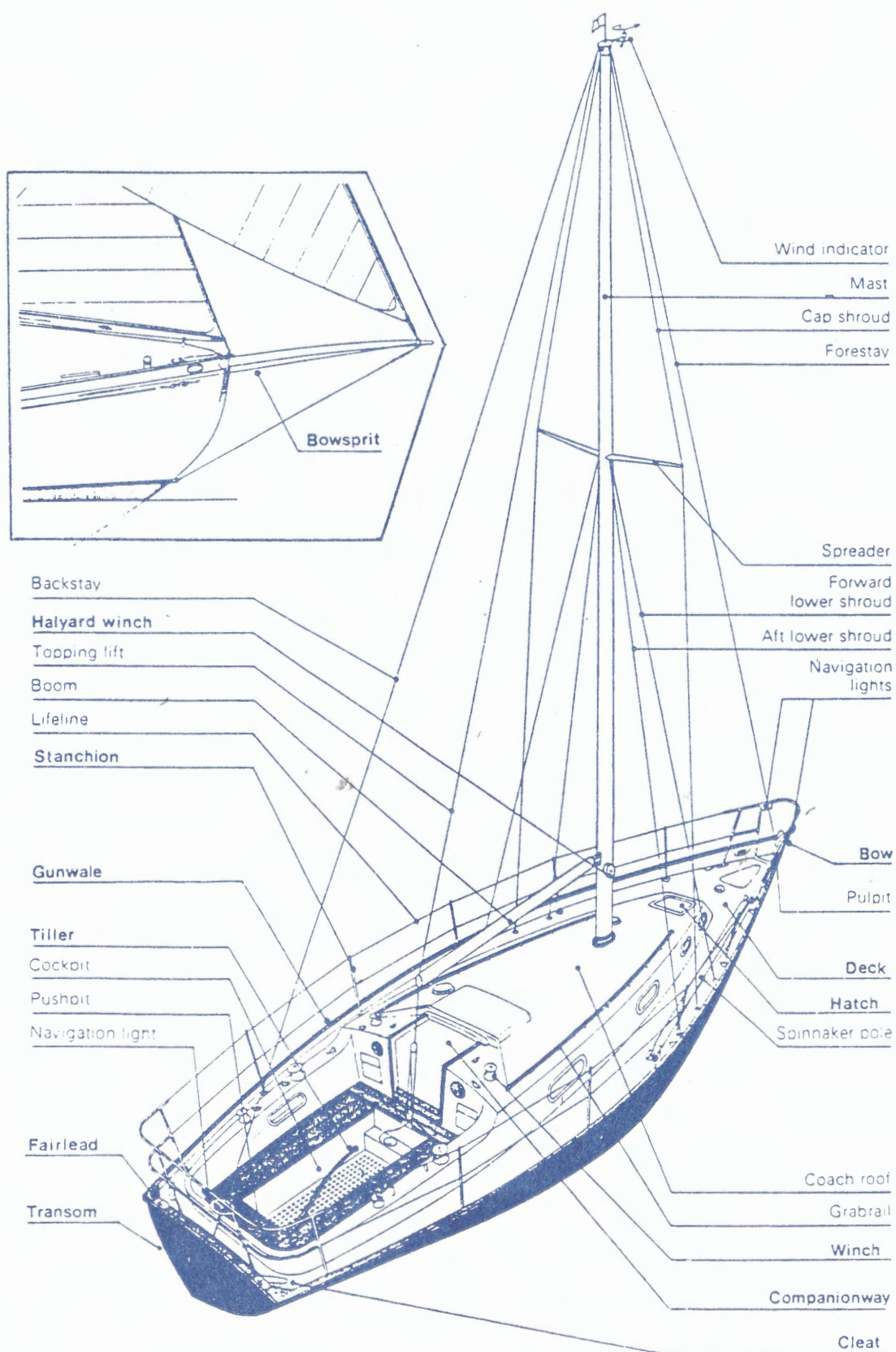
3. THE KEEL

- Prevents sideways drift i.e. gives lateral stability.
- Enables the boat to sail to windward.
- Keeps the boat upright by its weight.

4. THE SAILS

The sails are the principal driving force of the boat (they act as the boat's engine). Most sails are triangular in shape and are designed with a camber by joining curved panels to produce greatest forward drive with the minimum drag. The size and the shape depend upon the design and purpose of the boat.

YACHT HULL, SPARS, RIGGING AND FITTINGS



PARTS OF THE BOAT

1. PORT AND STARBOARD SIDE
Facing towards the bow of the boat, the port side is on your left and the starboard side is on your right.
2. BEAM
The widest part of the boat.
3. LENGTH OVERALL
The length of the hull between extremities (not including bowsprit).
4. WATERLINE LENGTH
The straight line distance between the point where the bow emerges from the water and the point where the stern emerges from the water.
5. DRAFT
The distance from the waterline to the lowest part of the boat.
6. TOPSIDES
The sides of the boat between the waterline and the deck.
7. AFT
Near the stern, behind, in back.
8. TILLER
A stick attached to the rudder for steering.
9. RUDDER
A flat, hinged board near the stern that deflects the passing water one way or the other to change the boat's direction.
10. COCKPIT
The part of the boat that is not decked over.
11. STANDING RIGGING
All the permanent wires that hold the mast up. Broken down into two categories:
 - 11.1 Stays
That keep the mast from falling toward the bow or stern.
 - 11.2 Shrouds
That keep the mast from falling over the port or starboard side (upper and lower shrouds).

12. RUNNING RIGGING

All movable rigging mainly:

12.1 Halyards

The wires (and/or ropes) that pull the sail up. They are attached to the sails with shackles (U-shaped fittings). Never let go of the end of a halyard. It will begin to swing in the breeze and slide its way up to the top of the mast. Always make sure that both ends of a halyard are attached to something.

12.2 Sheets

The lines with which you trim the sails. The mainsheet is led through a series of blocks (pulleys) to your hand or a cam cleat. It controls the swing of the boom, in or out. The jibsheet is attached to the clew of the jib. They are led, one on either side of the mast, through the fairleads (eyes or blocks on a track), around a winch (cylindrical drum increasing your mechanical advantage) to your hand or cam cleat. The jib is almost always trimmed on the leeward side (where the boom is) of the boat. Stop knots should be tied in the end of the jibsheet.

13. OTHERS

13.1 Outhaul

The rope (and/or wire) that attaches the clew of the mainsail to the outboard end of the boom. It is used to adjust the tension along the foot of the mainsail. Taut, for a flat sail: sailing upwind and/or on a breezy day. Loose, for a baggy sail: sailing downwind and/or on a calm day.

13.2 Downhaul

The tackle (rope and blocks) that holds down the inboard end of the boom. It is used to adjust the tension along the luff of the mainsail. Just like the outhaul: taut, for a flat sail - upwind and/or breezy. Loose, for a baggy sail - downwind and/or calm.

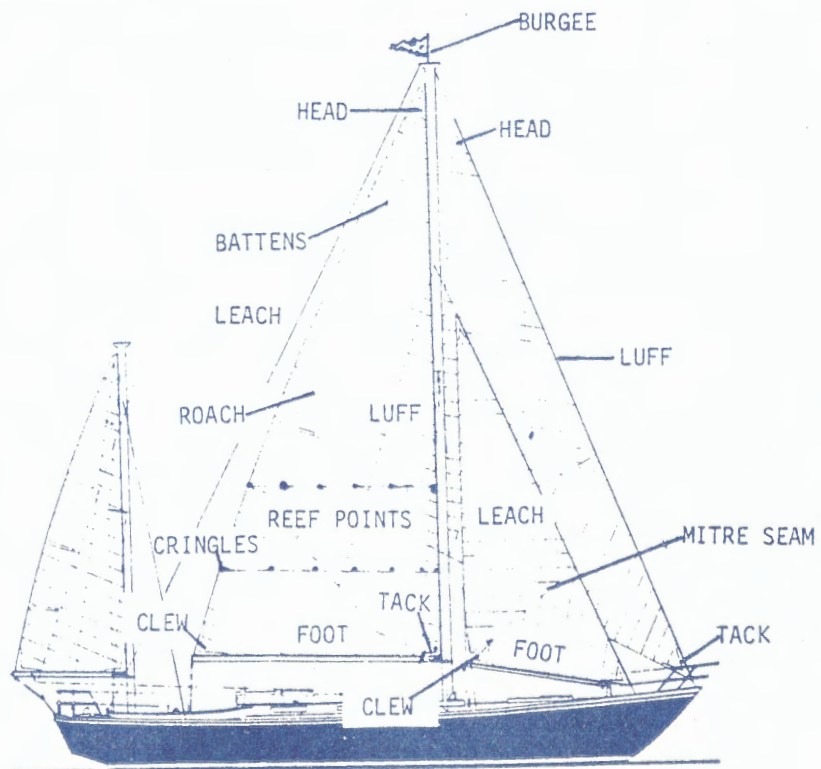
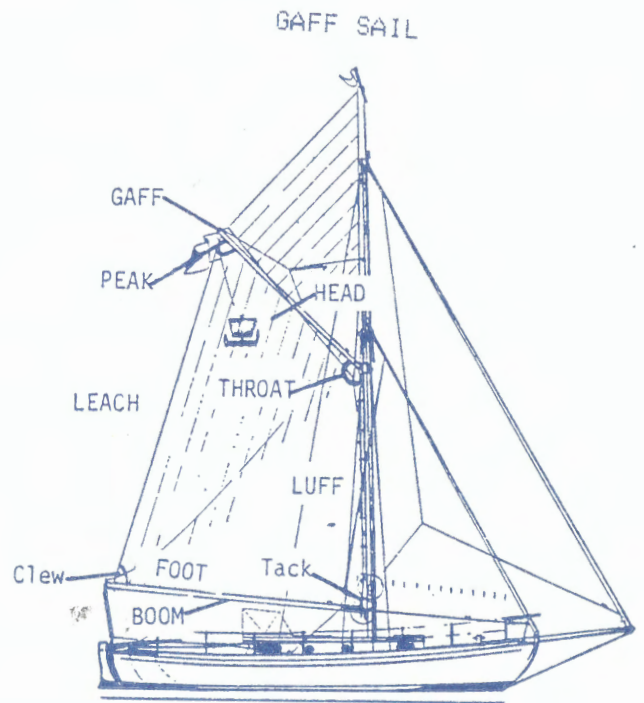
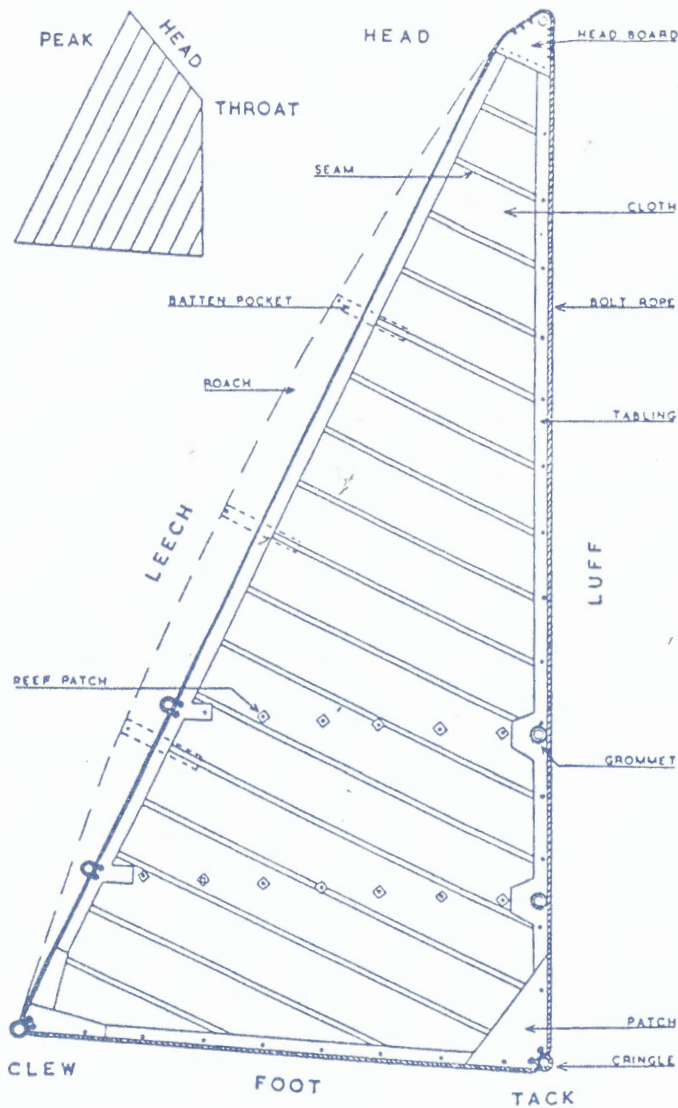
14. SPREADERS

Crossbars on the mast to spread the angle the shrouds make with the mast and thereby increase their leverage.

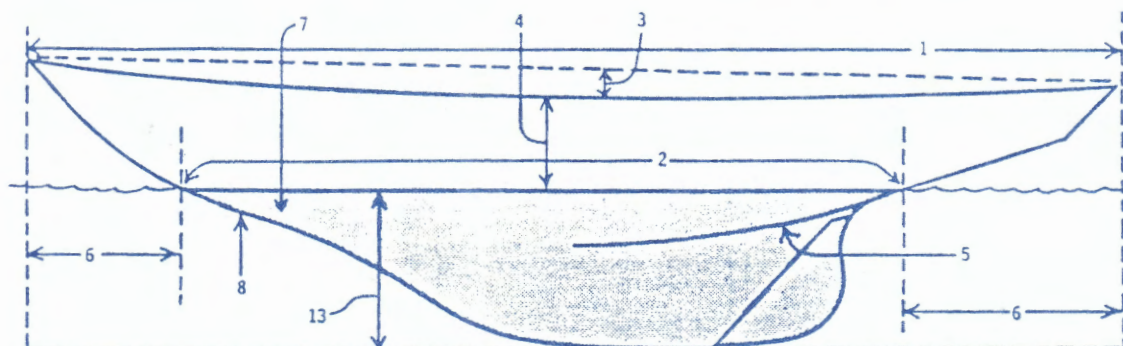
15. TELLTALES

The short pieces of yarn attached to the shrouds and the backstay. They show how the wind is striking the boat. The helmsman must constantly be checking the telltales on the windward side (the side of the boat that the wind is coming over). They indicate how the sails should be trimmed.

PARTS OF A SAIL

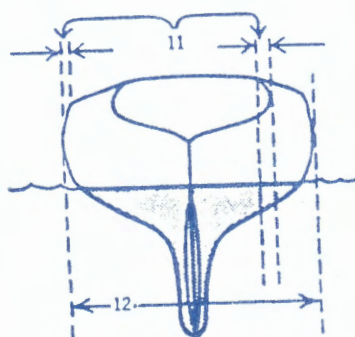
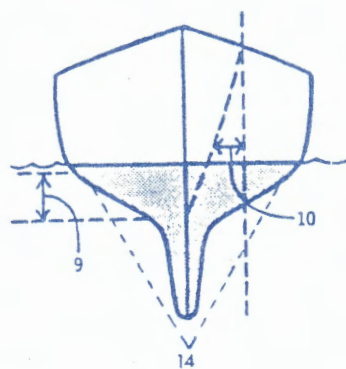
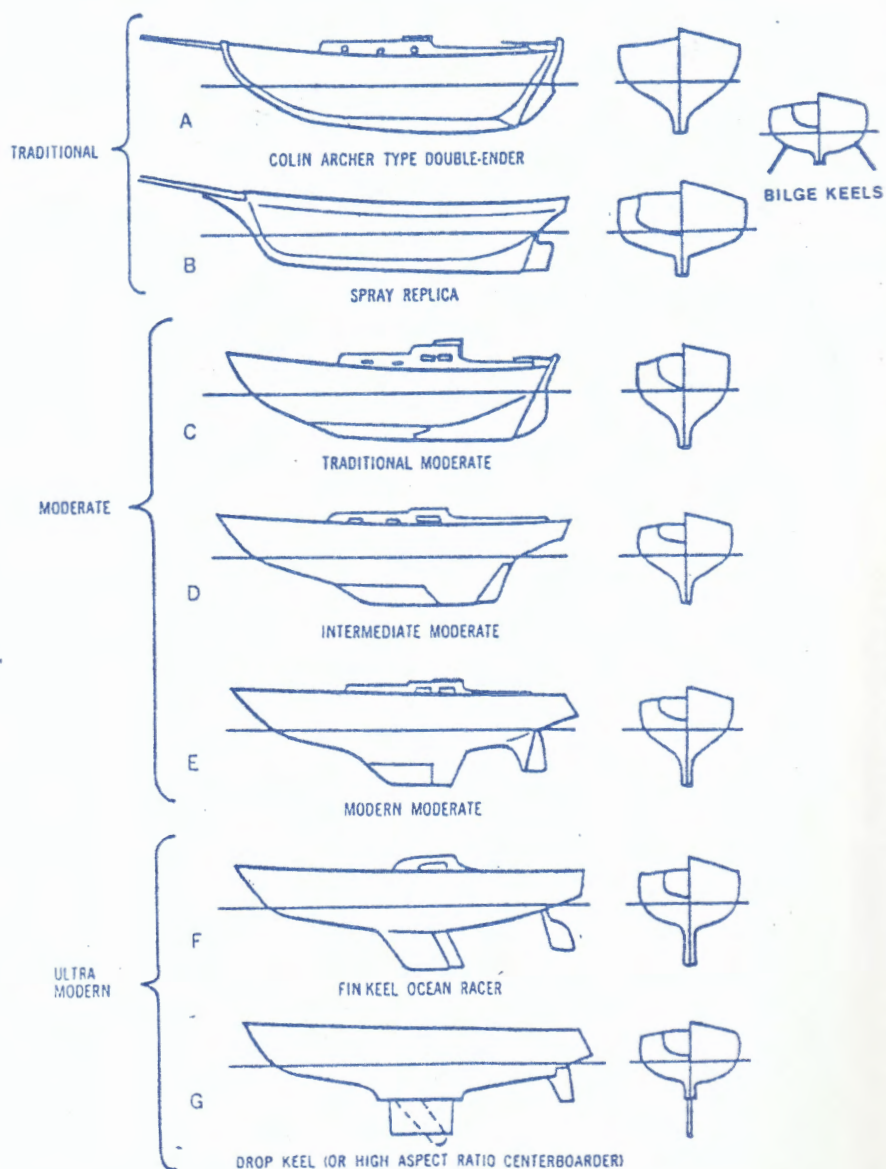


DESCRIPTIVE TERMS FOR THE HULL

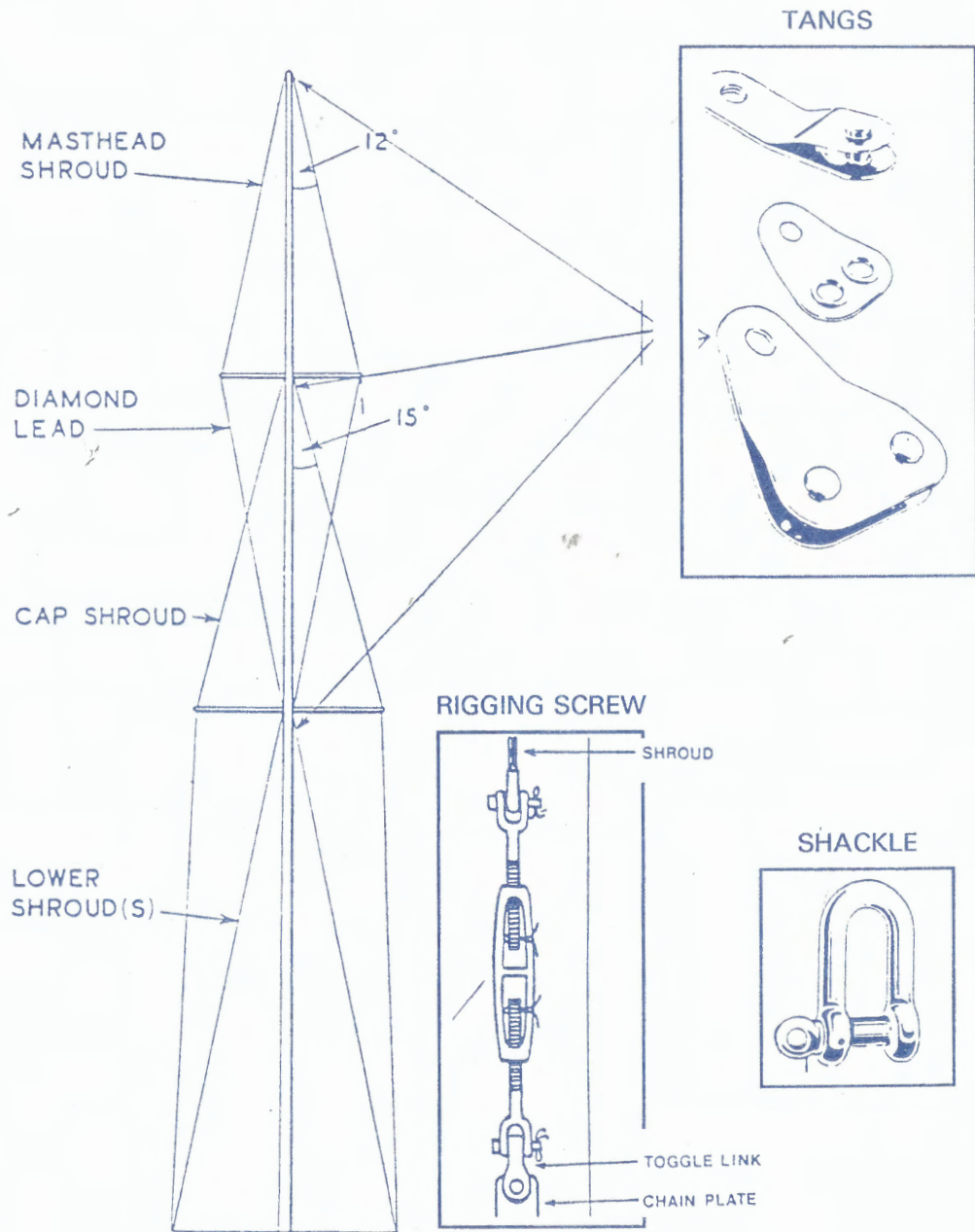


- 1 LENGTH OVER ALL
- 2 LOAD WATER LINE
- 3 SHEER
- 4 FREEBOARD
- 5 RUN
- 6 OVERHANGS
- 7 ENTRANCE
- 8 FOREFOOT
- 9 DEADRISE
- 10 FLARE
- 11 TUMBLE HOME
- 12 BEAM
- 13 DRAFT
- 14 BILGE

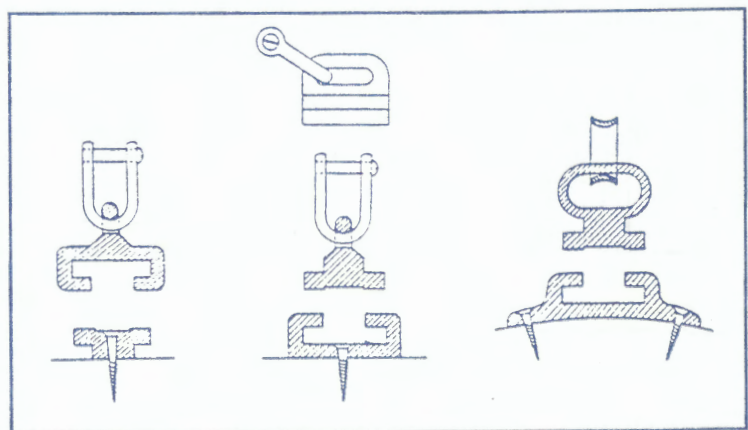
KEELS



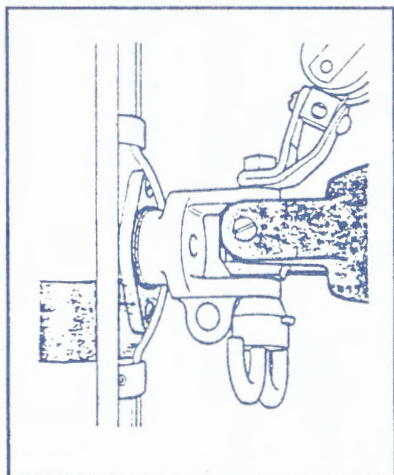
MASTS, SPARS, FITTINGS AND RIGGING



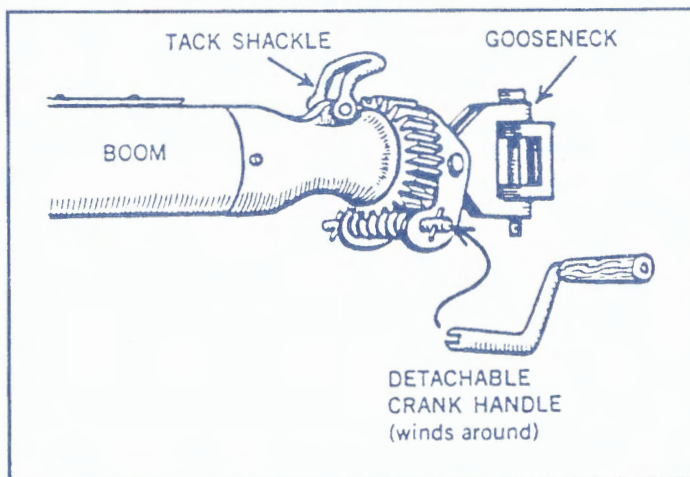
SLIDES/SLUGS AND TRACK SECTIONS



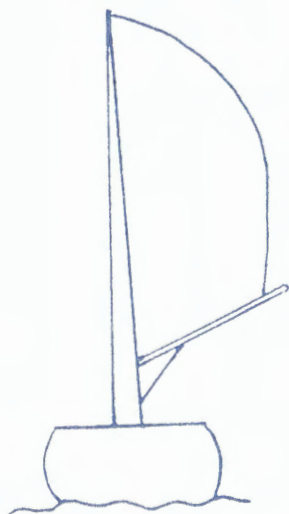
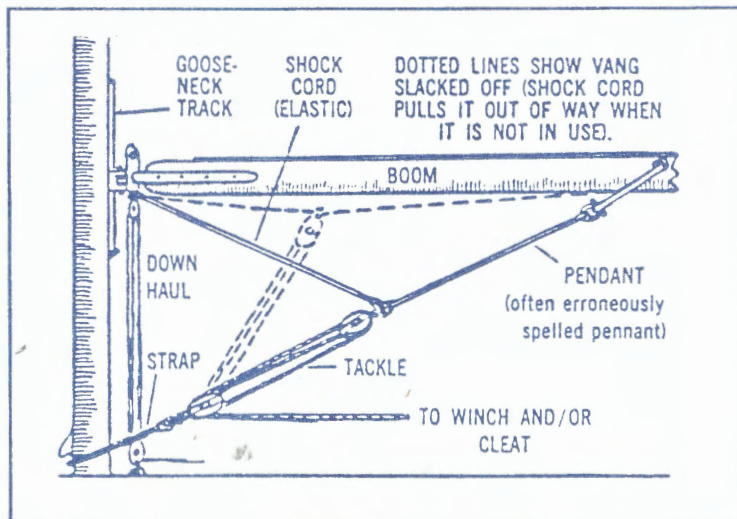
GOOSENECK



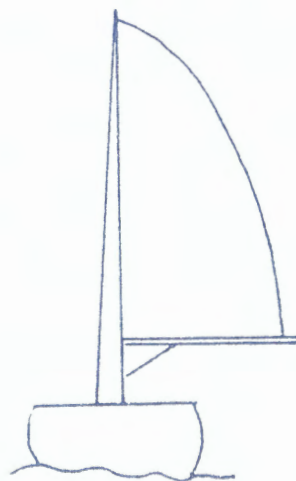
ROLLER REEFING GEAR



BOOM VANG/KICKING STRAP



TWISTED



CORRECTED

SAILING TERMS

1. WINDWARD

The direction from which the wind is blowing.

2. LEEWARD

The direction to which the wind is blowing.

3. PORT AND STARBOARD TACK

Opposite to the side the mainsail is on. If the mainsail is on the starboard side, the boat is on the port tack and vice-versa.

4. TO TACK

To change from the port tack to the starboard tack (or vice-versa) turning the bow of the boat into the wind. The command of preparation is "Ready About". The command of execution is "Helms - a - Lee".

5. TO JIBE

To change from the port tack to the starboard tack (or vice-versa) turning the bow of the boat away from the wind (downwind). The command of preparation is "Prepare to Jibe" and the command of execution is "Jibe Ho". Imagine yourself on a boat. Face the wind. If you turn the boat so the bow swings through the direction you're facing, it's a tack. If you turn the boat the other way, it's a jibe. Remember the two "T's" - Tack Towards (the wind).

6. A BEAT, TO BEAT, BEATING

A series of tacks.

7. POINTS OF SAILING

Describing the direction of the boat in relation to the direction of the wind.

7.1 Closehaunched

About 45 degrees from the wind.

7.2 Reach

About 90 degrees from the wind. Wind is "abeam".

7.3 Run

About 180 degrees from the wind. You are sailing "downwind".

8. BY THE LEE

If the boat has been turned too far downwind, so that the wind is now coming over the same side of the boat that the main boom is on, you are sailing "by the lee". Risky.

9. IN IRONS
When the boat is headed into the wind and has lost all forward motion it is "in irons". The rudder will no longer turn the boat (unless it is drifting backwards), since it works only by deflecting the passing water.
10. TRUE WIND
The actual direction the wind is blowing.
11. APPARENT WIND
The vector (change in wind direction) produced by the boat's forward speed.
12. WEATHER HELM
The tendency of a boat to head into the wind if the helm is dropped.
13. LEE HELM
The tendency of a boat to head away from the wind if the helm is dropped.
14. A HEADER
A change in wind direction towards the bow of the boat.
15. A LIFT
A change in wind direction towards the stern of the boat. Remember that a header for a boat on the port tack is a lift for a boat on the starboard tack.
16. VEERING
A change in wind direction clockwise in relation to the compass. Northeast to East, for example.
17. BACKING
A change in wind direction counter-clockwise in relation to the compass. West to Southwest, for example.
18. BERNOULI'S PRINCIPLE
Simply that if the velocity of the air flowing past one side of an airfoil is greater than that on the other side, the pressure correspondingly decreases on the former side creating a suction like that which creates the lift of an airplane's wing and the pull of a boat's sail.
19. SLOT EFFECT
The funnelling of air behind the mainsail through the slot formed between the main and the jib. This increases the velocity of the air on the lee side of the main, thereby increasing its suction and efficiency.
20. BACKWIND
Caused by the slot being too narrow and forcing the funnelled air into the backside of the main, rather than past it. Backwind makes the main appear to be luffing.
21. SURFING
Being pushed by the motion of the wave, much like a surfboarder.

22. PLANING

Increased speed by skimming along the surface of the water. Depends upon the shape of the hull and the boat weight. Most keel boats cannot plane.

23. STABILITY

The relation of the centre of buoyancy to the centre of gravity. The further apart they are, the greater the stability.

24. POSITIVE OR ULTIMATE STABILITY

The boat with positive stability will always, like a cat, end right-side up (unless she fills with water). Most cruising boats have positive stability, can be closed up tight so no water can enter, and have self-bailing cockpits.

25. HULL SPEED

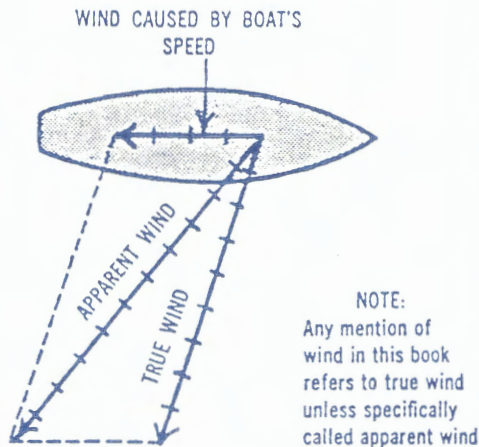
The theoretical speed beyond which a displacement boat cannot go, usually $1.34 \times \text{LWL}$.

26. COLLISION COURSE

If the relative bearing of the two converging yachts doesn't change, eventually they will collide.

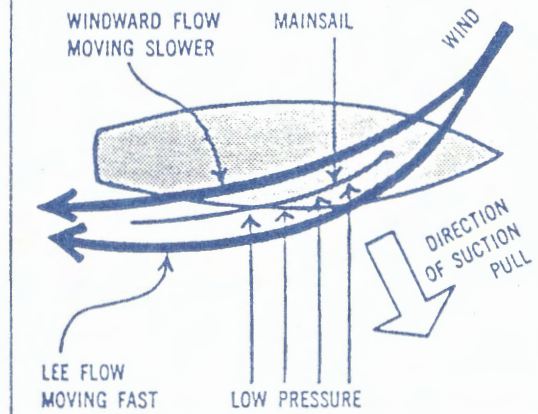
THEORY OF SAILING

APPARENT WIND

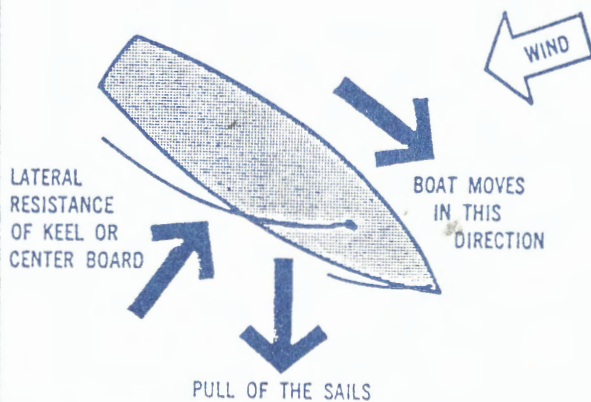


If true wind is 9 knots and boat speed is 4 knots, then apparent wind is 11 knots.

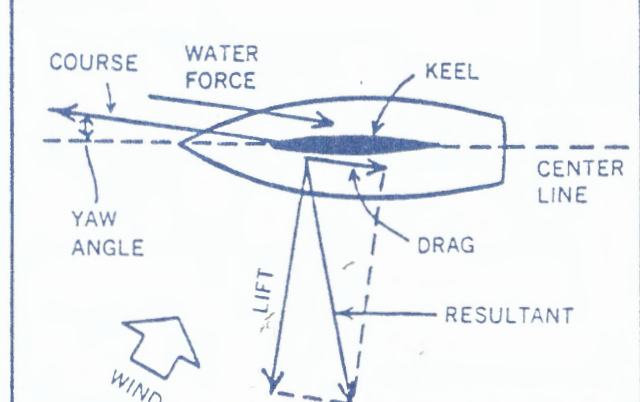
LEE SIDE SUCTION



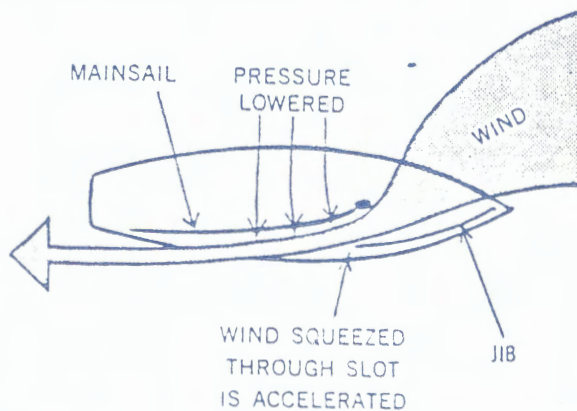
FORCES WHEN SAILING UP WIND



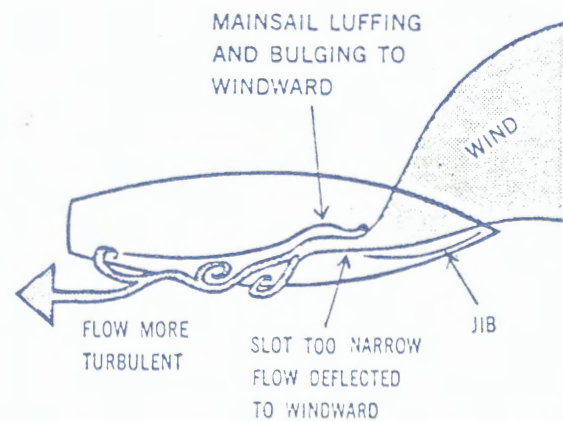
KEEL-WATER FORCE



VENTURI EFFECT OF JIB SLOT

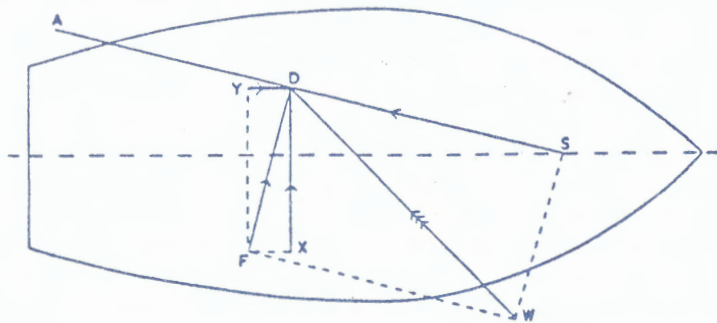


JIB BACKWIND



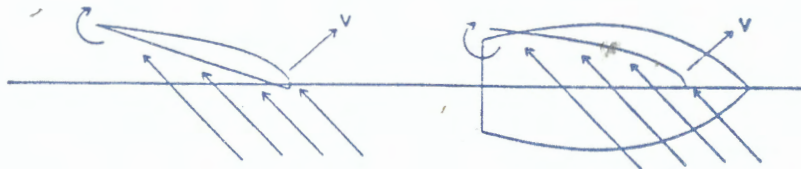
THEORY OF SAILING

PARALLELOGRAMS OF FORCES APPLIED TO THE WIND ON A CLOSE-HAULED SAIL



SA = The yacht's sail
 WD = Direction and force of the wind
 FD)
 SD) = Resultant forces of the wind
 XD)
 YD) = Resultant driving forces

THE PARTIAL VACUUM, V , CAUSED BY THE WIND AT THE LEADING EDGE OF AN AIRCRAFT'S WING (left) AND A CLOSE-HAULED SAIL (right)



SAIL TRIM

(TOP VIEW OF JIB)



A. PROPER FLOW
 (Both telltales stream aft.)

B. JUST BEFORE LUFF
 (Windward telltale flutters)
 1. Beating: fall off
 2. Reaching: trim sheet

C. STALLED
 (Leeward telltale flutters)
 1. Beating: Head up
 2. Reaching: Ease sheet

DIRECTIONAL TERMS

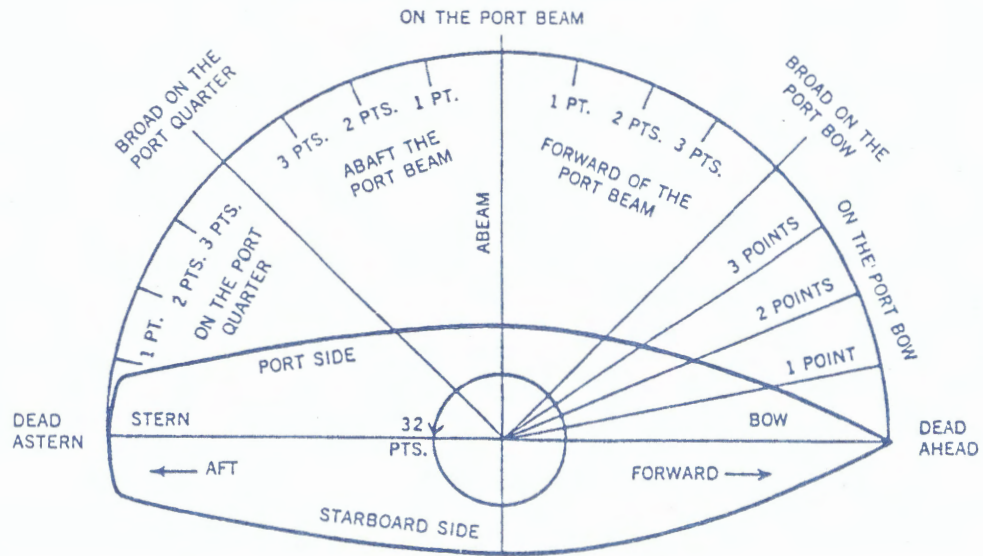
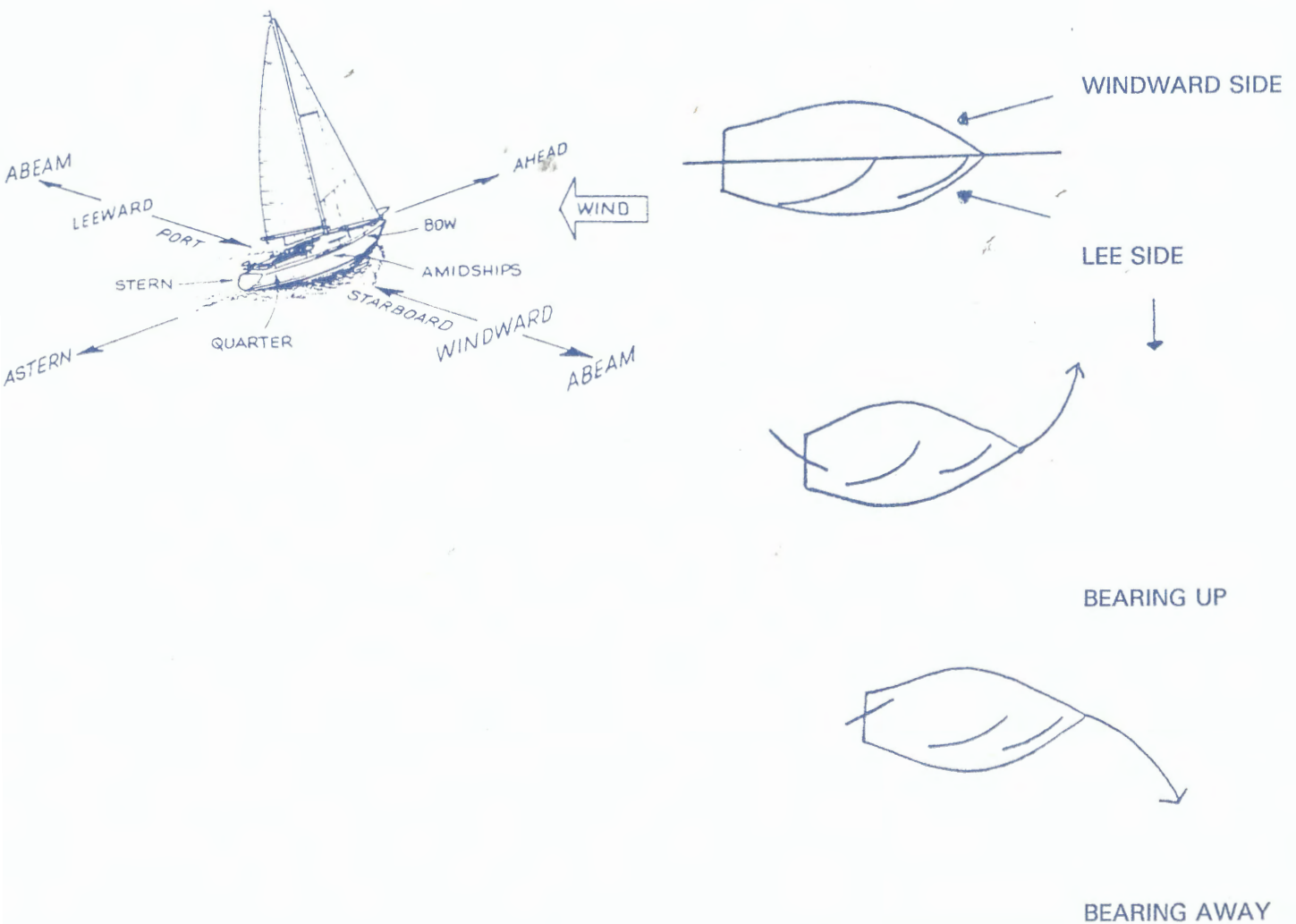


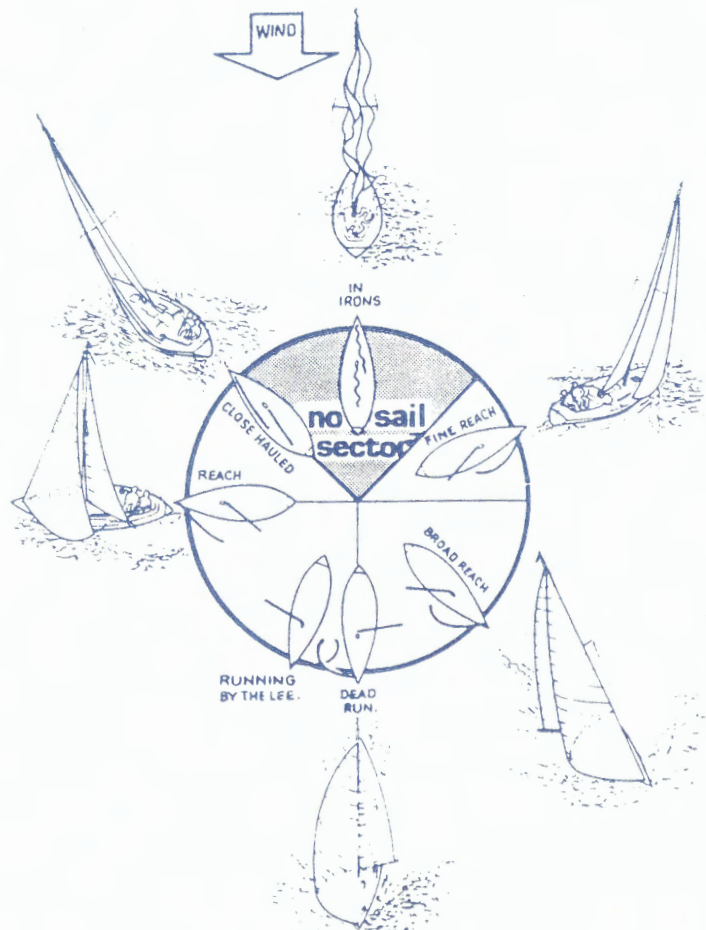
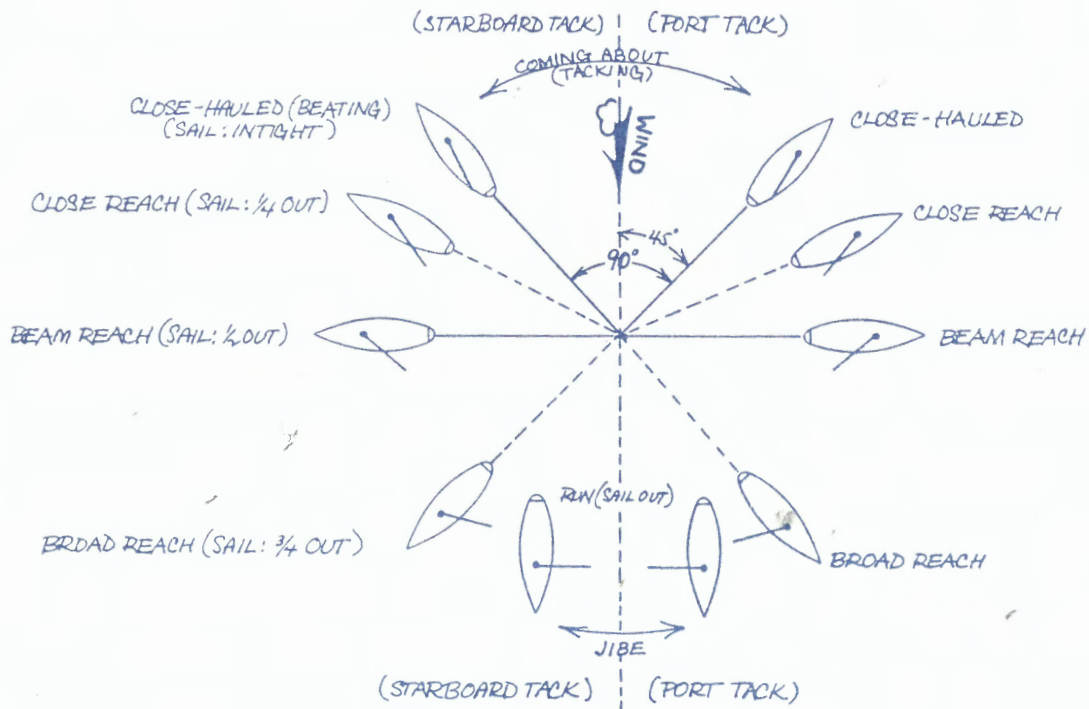
Diagram shows the port side; the same system applies to the starboard side

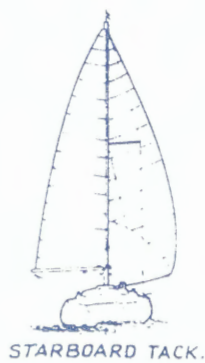
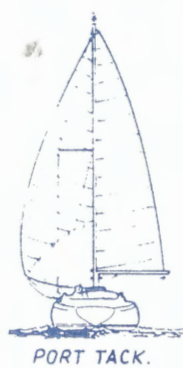
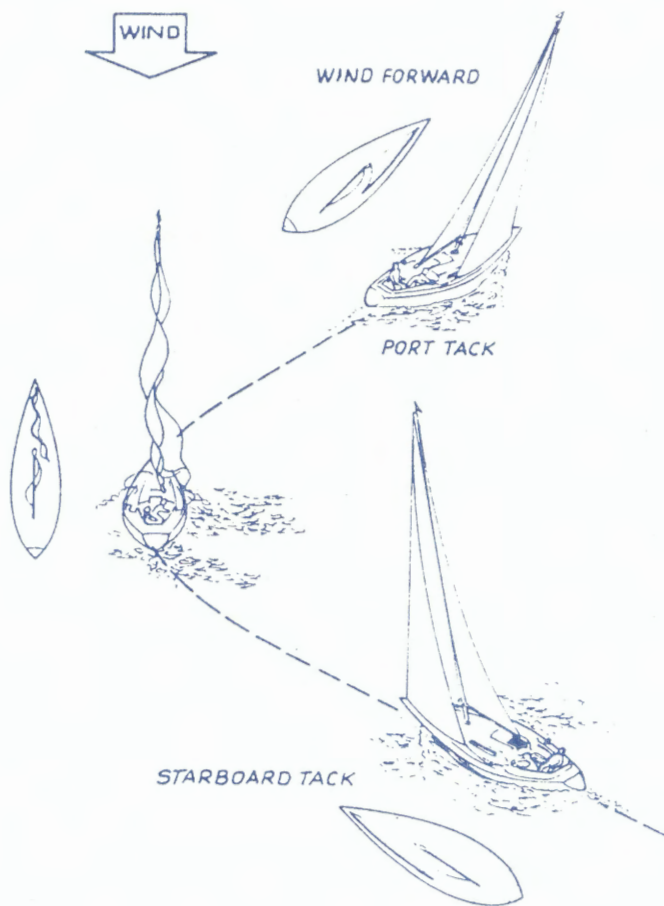
CIRCULAR DISTANCE AROUND THE YACHT DIVIDED INTO 32 POINTS

(a point equals $11\frac{1}{4}^\circ$)



POINTS OF SAILING





WIND

GOING ABOUT / TACKING
(Passing bows through wind)

CALL

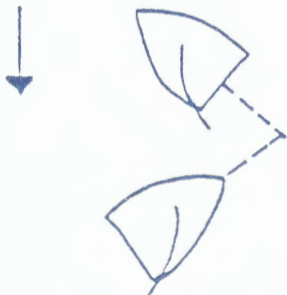
- 1) HELMSMAN "Ready to go about"
- 2) CREW RESPOND "Ready"
- 3) HELMSMAN "Helms-a-Lee"

GYBE
(Passing stern through wind)

CALL

- 1) HELMSMAN "Ready to gybe"
- 2) JIB SHEET HANDS RESPOND "Ready"
- 3) HELMSMAN "Sheet in the Main"
- 4) MAINSHEET HANDS RESPOND "Ready"
- 5) HELMSMAN "Gybe-O"

GOING ABOUT / TACKING
(Passing bows through wind)

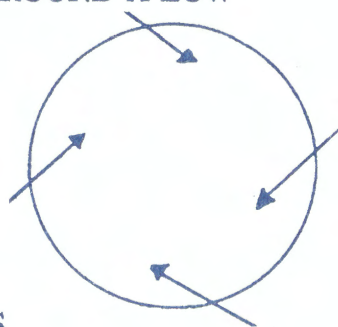


BASIC METEOROLOGY

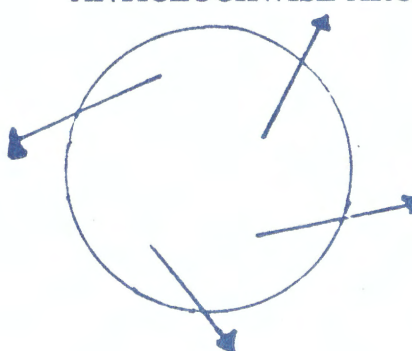
WEATHER

IN THE SOUTHERN HEMISPHERE winds blow

CLOCKWISE AROUND A LOW



ANTICLOCKWISE AROUND A HIGH



INSTRUMENTS

- a. BAROMETER. An instrument which measures atmospheric pressure in millibars. A yacht normally carries an aneroid barometer, which is a partly evacuated, sealed metal box. This has a thin corrugated face (or two faces kept apart by a spring) which reacts to changes in atmospheric pressure. The reaction is transmitted by a system of sensitive levers to a pointer which indicates pressure on a graduated dial.
- b. BAROGRAPH. An instrument which continuously records atmospheric pressure. An arm fitted with a pen, connected by a system of levers to an aneroid barometer, makes a trace on a chart wrapped round a clockwork drum which rotates once in seven days.

This gives you:

- i. a weekly record;
- ii. a visual indication of immediate trends. The time scale of rise and fall in pressure also indicates likely approaching weather conditions and wind speeds, i.e., fall of 1 or 2 millibars/hour indicates approach of Southwester, which will hit as the graph bottoms out.

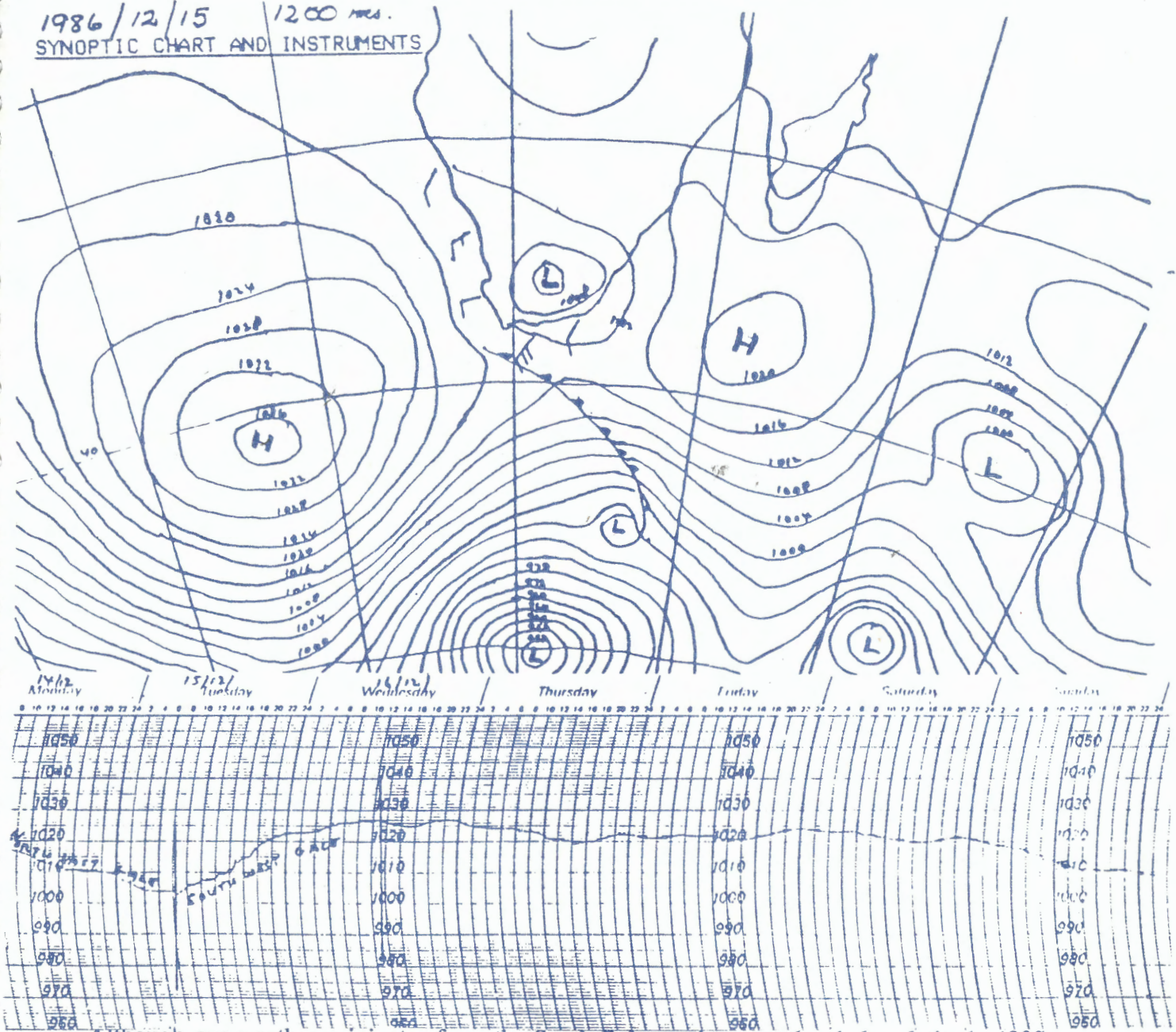
Sources of meteorological information in Durban are:

1. Daily synoptic chart - Ocean Sailing Academy;
2. Barographs - Ocean Sailing Academy
Royal Natal Yacht Club
Point Yacht Club.
3. Recorded forecast - Durban
4. Coastal pressures and detailed analysis - Durban 42-4224/5 - Duty Forecaster Louis Botha Airport.

Tidal information - S.A. Tide Tables
Media
Kings Sports, etc.

SYNOPTIC CHART AND INSTRUMENTS

1986/12/15 1200 hrs.
SYNOPTIC CHART AND INSTRUMENTS



Although our weather originates from the South Polar region, weather below latitude 40°S does not directly affect us.

In general our weather pattern moves from West to East.

- Isobars are lines of equal barometric pressure - rather like the contour lines on a map.
- They indicate areas of High and Low pressure.
- The gradient or spacing of Isobars indicates likely wind speeds, i.e., Isobars widely spaced - little wind, closely spaced - strong wind.

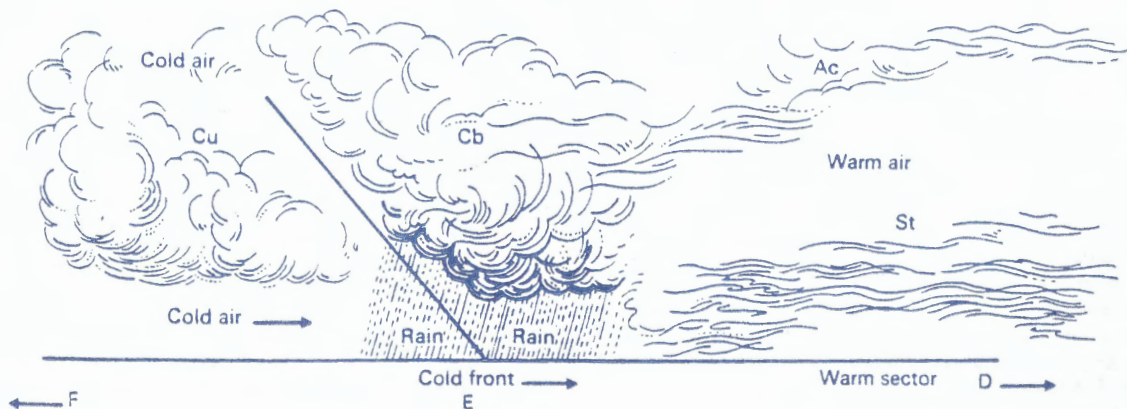
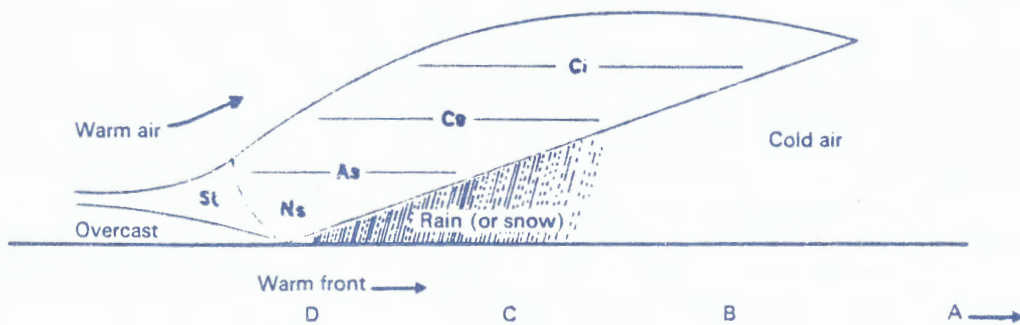
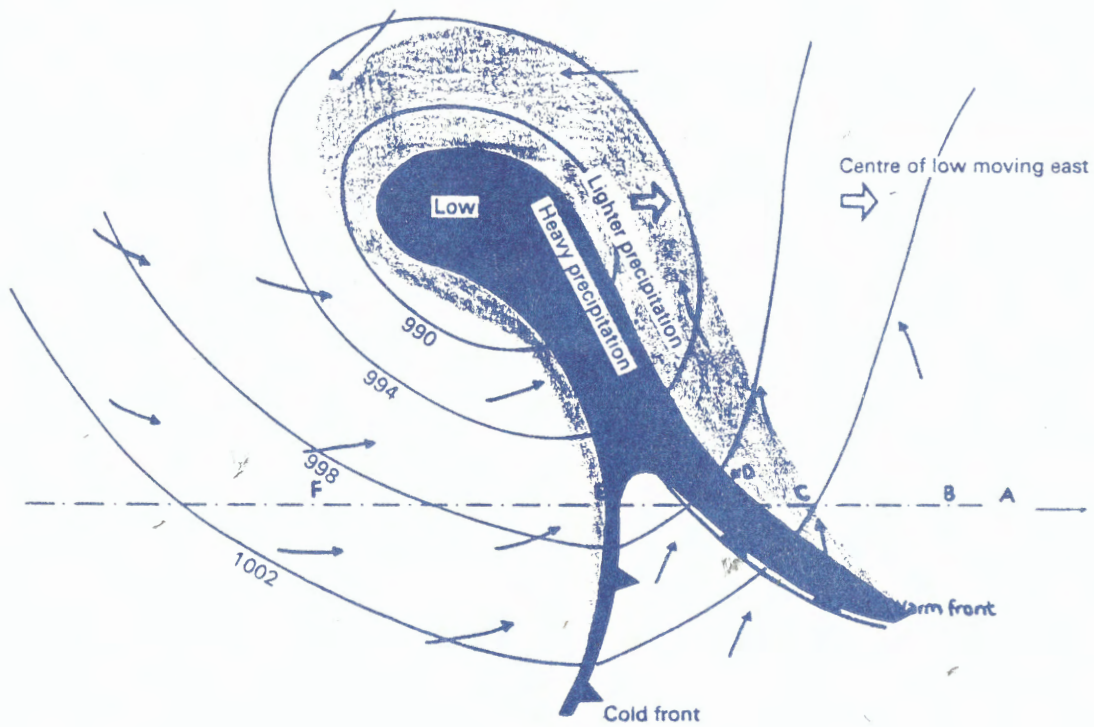
In general, winds blow from High to Low pressures.

BEAUFORT SCALE

Beaufort Scale			State of sea (description in brackets)	Ashore	Probable wave height ft/m	Probable max. wave height ft/m
Force	Mean speed (knots)	Description				
0	0-1	Calm	Like a mirror (calm)	Calm; smoke rises vertically	0/0	0/0
1	1-3	Light air	Ripples only (calm)	Direction of wind shown by smoke	0/0	0/0
2	4-6	Light breeze	Small wavelets, not breaking (smooth)	Wind felt on face; leaves rustle	0.7/0.1	1/0.3
3	7-10	Gentle breeze	Large wavelets, crests begin to break; a few white horses (smooth)	Leaves in constant motion; wind extends light flag	1.2/0.4	3/1
4	11-16	Moderate breeze	Small waves growing longer; fairly frequent white horses (slight)	Raises dust; small branches moved	3/1	5/1.5
5	17-21	Fresh breeze	Moderate waves, taking more pronounced form; many white horses, perhaps some spray (moderate)	Small trees in leaf begin to sway, crested wavelets on inland waters	6/2	8/2.5
6	22-27	Strong breeze	Large waves forming; white foam crests more extensive; probably some spray (rough)	Large branches in motion; telephone wires whistle	10/3	13/4
7	28-33	Near gale	Sea heaps up; white foam streaks begin blowing from crests (very rough)	Whole trees in motion; difficult to walk into wind	13/4	18/5.5
8	34-40	Gale	Moderately high waves of greater length; crests break into spindrift, with foamy streaks (high)	Twigs break off trees; wind impedes progress	18/5.5	25/7.5
9	41-47	Severe gale	High waves with tumbling crests; dense streaks of foam; spray may affect visibility (very high)	Slight structural damage occurs (e.g. slates, chimney pots)	23/7	33/10
10	48-55	Storm	Very high waves with long overhanging crests and dense streaks of foam making surface of sea white; heavy tumbling sea; visibility affected (very high)	Seldom experienced inland; trees uprooted, structural damage occurs	30/9	41/12.5
11	56-63	Violent storm	Exceptionally high waves; sea completely covered with long white patches of foam along direction of wind; visibility affected (phenomenal)	Very rarely experienced; wide spread damage caused	36/11	52/16
12	64 plus	Hurricane	Air filled with foam and spray; sea white with driving spray; visibility very seriously affected (phenomenal)	--	46/14	--

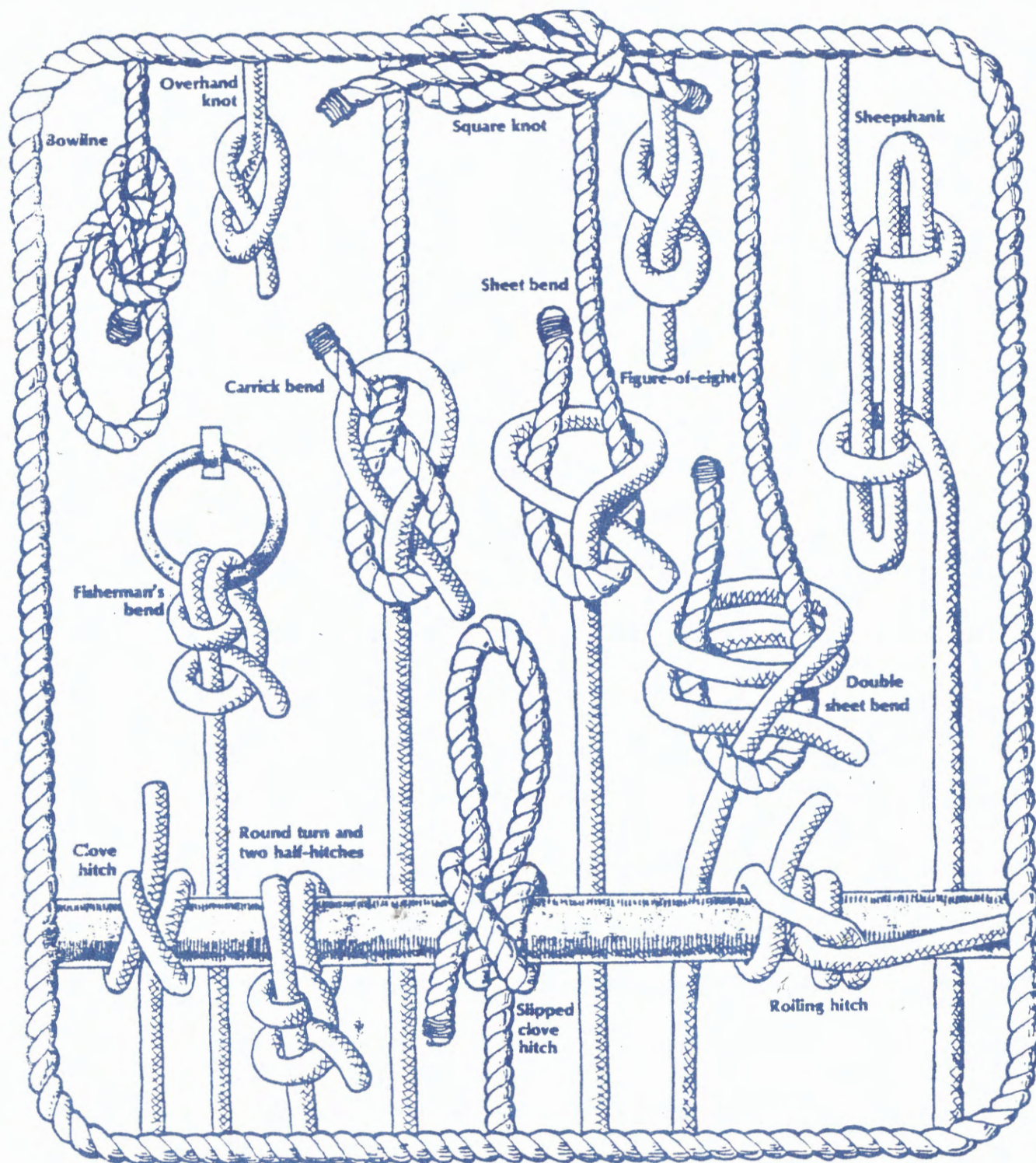
Note: The wave heights above are only a guide to what may be expected in the open sea, away from land.

NORTHERN HEMISPHERE



The passage of a depression.

KNOTS



Knots are tied in the length of line itself, without incorporating another line in their basic formation. **Overhand knot:** The simplest knot, used to temporarily prevent a line from unlaying or as a stopper to prevent a line from unreeving through a block or fairlead. **Figure-of-eight:** Better stopper knot than overhand knot because it is larger and easier to untie. Also serves as temporary knot to keep severed line from unlaying. **Bowline:** The universal seaman's knot that serves a variety of purposes: temporary eye in the end of a line instead of permanent eye splice; attaching sheets to clew of sail in place of shackle. Strong and reliable. It never slips or jams. **Sheepshank:** A reliable knot used to take up slack in a line without touching the ends, such as shortening a

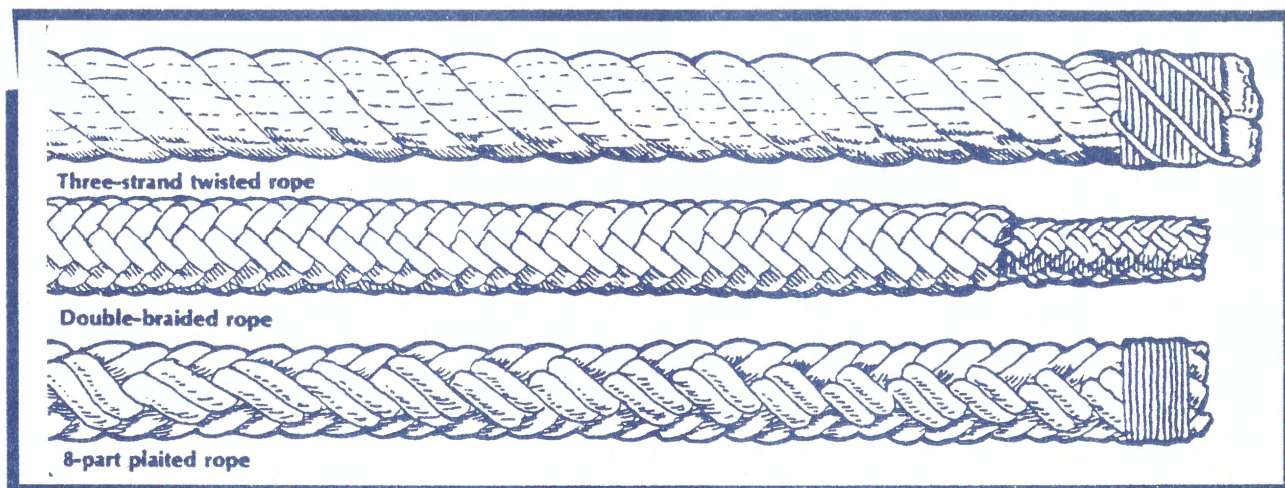
dinghy painter. **Square knot or reef knot:** Used properly, tied to itself, it is a bundling knot often used to tie sail stops and reef points. It should never be used as a bend to join two dissimilar pieces of rope.

Bends are used to join the ends of two lines or to secure a line to an eye, ring or thimble. **Fisherman's bend (anchor bend):** Used to secure a line to an anchor ring or spar. Simple and strong. **Carrick bend:** Used to join large hawsers, it is strongest when pulled taut, when the bend "rolls over" and assumes a different shape. A difficult bend to remember, but if tied properly, it is easily untied and does not jam. **Sheet bend (becket bend):** Used to join two lines of different sizes or a line to a ring. Does not slip or

jam. **Double sheet bend:** Improved sheet bend. Cannot jam, will not slip.

Hitches are used to tie a line to an object such as a bollard or rail. **Clove hitch:** A quick and easy means of securing a line to a bollard or rail, reliable only if the strain is perpendicular to object on which it is tied. **Round turn and two half hitches:** The best quick method of hanging an object perpendicularly from a rail. **Slipped clove hitch:** A special-purpose quick-release hitch useful for securing tenders to a lifeline or rail. **Rolling hitch:** Used when strain on line is parallel to object on which it is tied, such as securing a flag halyard to a shroud or a bosun's chair safety line to the mast. As strain comes on standing part of the hitch tightens, resisting tendency to slip.

ROPES



Minimum Breaking Strength in Pounds ¹										
Diameter		Twisted and Plaited Ropes					Braided Ropes			
		Manila	Polypropylene	Polyester*	Nylon	Pre-Stretched Polyester*	Polyester* Double Braid	Pre-Stretched Polyester*	Nylon Double Braid	Low-Stretch Polyester*
Inches	MM									
3/16	5	406	720	900	900	1,300	1,00	1,050	-----	-----
1/4	6	540	1,130	1,490	1,490	1,550	1,800	1,250	2,100	2,200
5/16	8	900	1,710	2,300	2,300	3,300	2,800	2,650	3,500	3,300
3/8	9	1,220	2,240	3,340	3,340	4,000	3,750	-----	4,800	4,400
7/16	10	1,580	3,160	4,500	4,500	5,000	5,500	4,000	6,500	5,800
1/2	12	2,380	3,780	5,750	5,750	6,000	7,000	5,000	8,300	8,300
9/16	14	3,100	4,600	7,200	7,200	-----	10,000	-----	11,200	11,000
5/8	16	3,960	5,600	9,000	9,350	-----	14,000	-----	14,500	13,600
3/4	18	4,860	7,650	11,300	12,800	-----	16,000	-----	18,000	-----
7/8	22	6,950	10,400	16,200	18,000	-----	24,000	-----	26,500	-----
1	24	8,100	12,600	19,800	22,600	-----	28,000	-----	31,300	-----

¹These are Cordage Institute figures, which may vary from manufacturer to manufacturer. Safe working loads under normal conditions are typically 20% of each figure given.

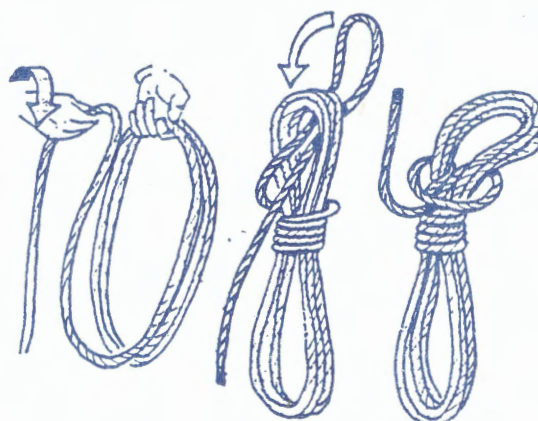
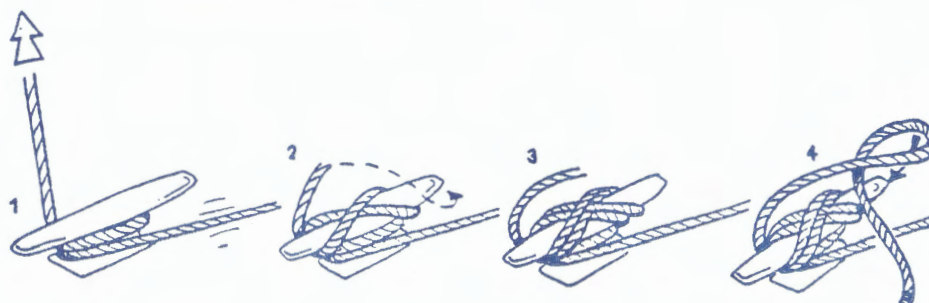
*Polyester is the generic term used for fibres manufactured under the trademarks of Dacron, Terylene and Duron.

Relative Qualities of Rope Fibres*				
	Manila	Polypropylene	Polyester	Nylon
Strength	1	2	3	4
Weight	3	1	4	2
Elongation	1	3	2	4
Shock resistance	1	2	3	4
Rot resistance	poor	excellent	excellent	excellent
Acid resistance	1	4	3	2
Alkali resistance	1	excellent	2	excellent
Sun resistance	fair	fair	good	good
Abrasion resistance	2	1	4	3
Buoyancy	none	indefinite	none	none
% moisture absorption	25.0	0	1.5	4.5
Cost	2	1	4	3

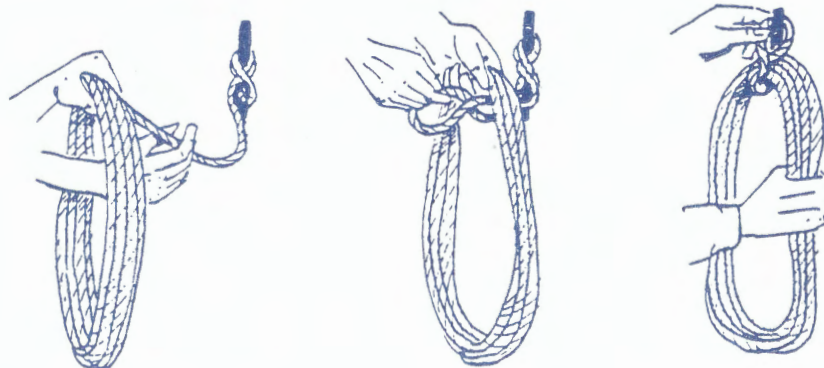
*Key: 1 least, 4 greatest

Suggested Rope Uses					
	Manila	Polypropylene	Polyester	Nylon	Pre-Stretched and Low-stretch Polyester
Anchor ropes	x			x	
Docking lines	x			x	
Towlines	x			x	
Sheets	x		x		
Halyards			x		x
Fender lines	x	x	x		
Sail boltropes			x		
Flag halyards	x		x		
Dinghy painter	x	x	x	x	
Heaving Line	x	x	x		

Cleating a Line



Coiling a Line

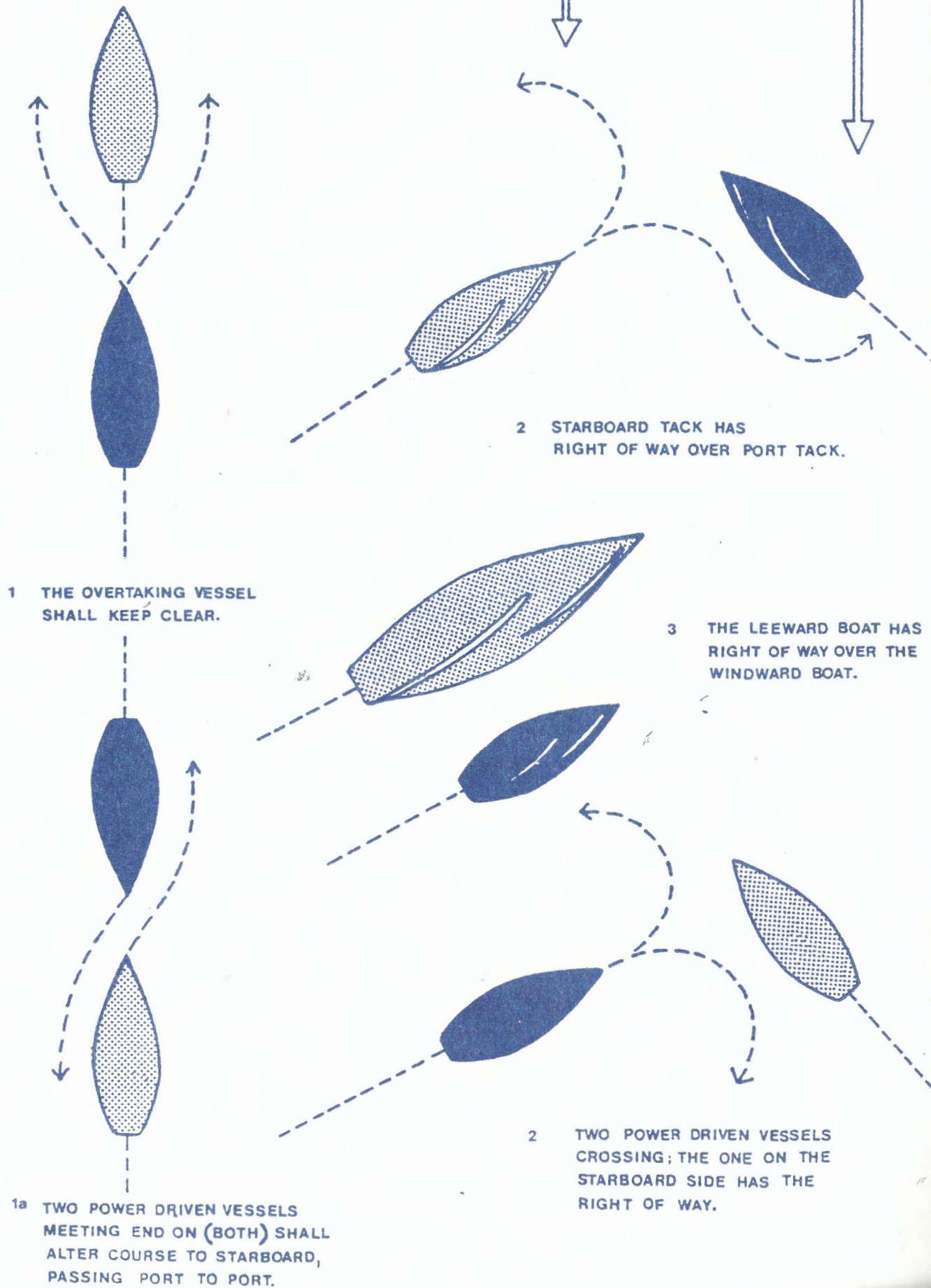


Coiling a Halyard

DAY TWO

NOTES:

RULE OF THE ROAD

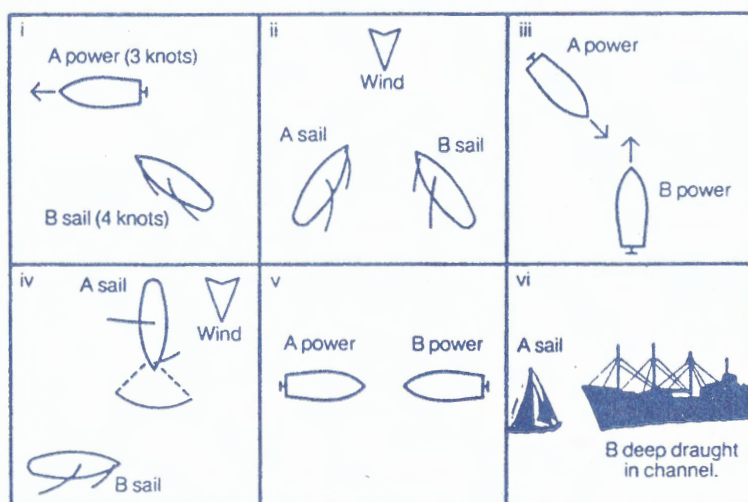


RULES OF THE ROAD

VERY IMPORTANT RULES ALWAYS TO BE REMEMBERED ARE:-

1. Keep a constant lookout AHEAD as well as ASTERN.
2. If bearing does not change appreciably, then RISK OF COLLISION will exist.
3. When you have RIGHT OF WAY, keep your course and speed until such time as, NO MATTER WHAT THE OTHER VESSEL DOES, a collision may occur, then you MUST TAKE AVOIDING ACTION.
4. When you must KEEP CLEAR - alter course well in advance and do a big alteration. LET THE OTHER VESSEL KNOW WHAT YOU ARE DOING. The larger the vessel you are avoiding, the earlier you must alter course.
- 5.1 Sailing vessels have NOT got right of way in most commercial harbours.
- 5.2 Congested waters or traffic separation lanes - where large vessels are manoeuvring.

Which of the following boats has right of way?



Answers:

- i) ii) iii) iv) v) vii)

EXTRACTS FROM "INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA" IN FORCE 15TH JULY 1977.

(Annotated for Yachtsmen)

Printed by T.H. Brickell and Son Ltd at the Blackmore Press.
1977 RYA and Lt.-Cmdr. W.S.B. Anderson

RULE 5

Look-out

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

NOTE TO RULE 5:

This is the most important Rule. If it is not observed, the rest of the Rules might as well not exist.

In a sailing yacht there are two potential blind arcs, on the lee bow and directly to windward. Low-clewed, long-footed headsails create a very large blind arc. Even a relatively high-clewed sail can have a similar effect when the yacht is well heeled. This blind arc is worst for crew members sitting to windward in the cockpit. A really effective lookout can often be kept, only if one member of the watch on deck sits to leeward, well aft in the cockpit.

The windward blind arc only exists in strong winds when the spray and rain sting the eyes. It is painful to look directly up-wind in a blow. Even the best designed oilskins will not keep the spray out in a full frontal attack so the natural instinct to stay dry does not encourage a good watch to windward. Oilskin hoods do not help much; if they are loose fitting enough to be comfortable they will not turn with the head. Looking over one's shoulder for a quick glance up-wind results only in a close-up view of the inside of the back of the hood! The old fashioned sou'wester with a huge flap at the back may not be quite as waterproof, but it does have the great practical advantage of turning in unison with the wearer's head. It's practical advantages probably outweigh its sartorial inelegance and combined with a high collar and neck towel, it allows an efficient lookout without getting too wet.

Motor yachts and motor sailors with enclosed steering positions enable a lookout to be kept in much greater comfort but the structure which provides the shelter creates its own blind arcs. These are particularly dangerous if the crew in the wheelhouse sit or stand in the same position for long periods. By doing so they run the risk of allowing another ship to approach on a steady bearing, and therefore a collision course, without being sighted. To keep an

effective lookout at night, "night vision" is needed. The human eye takes a considerable time to adapt to darkness after it has been exposed to white light.

The actual time varies from one individual to another, but on average it takes about fifteen minutes, after exposure to white light of normal domestic intensity, before eyesight is fully effective in near darkness. To overcome this problem the accommodation and chart table should be lit by red lights at night. A red light does negligible damage to night vision and is much more restful to the eyes. Similarly the use of searchlights and bright deck working lights should be kept to a minimum. Both are essential for certain operations, but a searchlight is particularly dangerous for two reasons. If it is inadvertently directed into another vessel's cockpit or wheelhouse it can cause sudden and unexpected night blindness to her crew. If its beam is relied on to pick up unlit navigational marks, the lookouts may see the marks which they are looking for quite clearly but, at the same time, fail to see other small boats or obstructions because their eyesight has been adversely affected by the use of the searchlight in the first place.

Smokers are always a potential hazard to night vision, the flare of a match or lighter being bright enough to cause loss of adaption to anyone in the wheelhouse or cockpit who looks directly at it. If you smoke, warn the rest of the watch before you light up, and close one eye yourself to save its night vision. A good listening watch is particularly important in conditions of poor visibility. It is impossible to listen effectively from inside a closed wheelhouse and, in fog, at least one of the watch should be stationed on the open deck. In many sailing yachts the noise of the auxiliary engine is loud enough to mask any sounds from outboard. If this is the case the engine should be slowed or even stopped for two minutes in five to allow an efficient listening watch to be kept.

RULE 6

Safe Speed

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

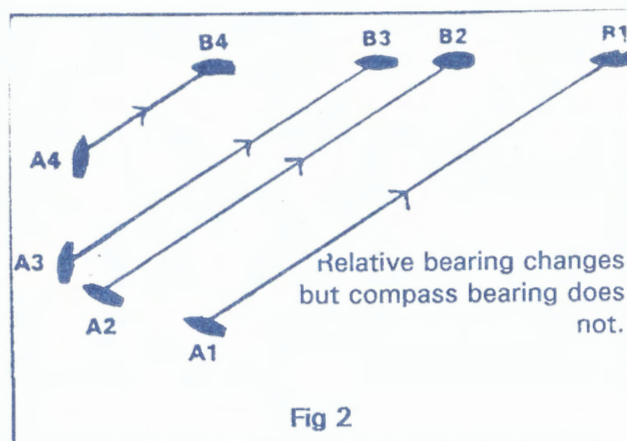
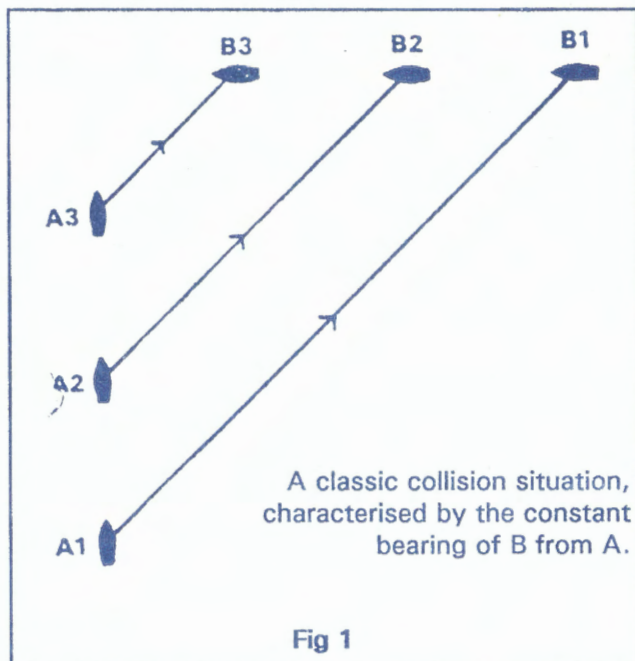
NOTE TO RULE 6:

A yacht, sailing at six knots, covers a mile in ten minutes and a ship steaming at twenty-four knots covers four miles in the same length of time. The skipper of our unhandy ketch meeting a fast container ship end on in a separation land (where he has to give way) has therefore to decide that he must alter course when the ship is seven miles away, if he is to be able to make a substantial alteration before the range has closed to two miles. The yacht which is sailed short handed under a cumbersome rig is undoubtedly contravening the spirit if not the letter of Rule 6. For the motor yacht, which may be considerably faster than its sailing counterpart, speed through the water may be, in itself, a hazard. High traffic density, poor visibility and a background of shore lights can all contribute to confusion, confusion which can only be increased by speed. It is impossible to be specific as to what is a safe speed, because the factors upon which it depends are so many and varied. Any skipper who is in any doubt as to whether he is going too fast probably is!

RULE 7

Risk of Collision

- a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.

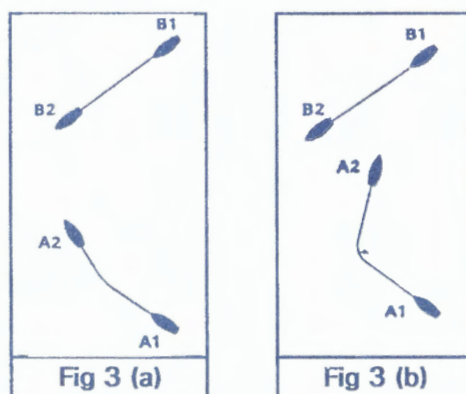
RULE 8

Action to avoid collision

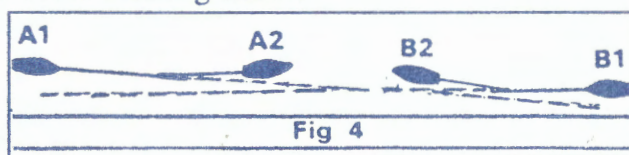
- A) Any action taken to avoid collision shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

NOTE TO RULE 8

For an alteration of course to be absolutely obvious, particularly at night, it should involve presenting a totally different "aspect" to the other ship. In Fig 3(a) the alteration between A1 and A2 is probably sufficient to avoid a collision, but, throughout the manoeuvre, A continues to present her starboard bow, or by night her starboard side light, to B. In Fig 3(b), however, the alteration between A1 and A2 is large enough to present a totally different aspect and it is abundantly clear to B that A has altered course to pass under her stern.



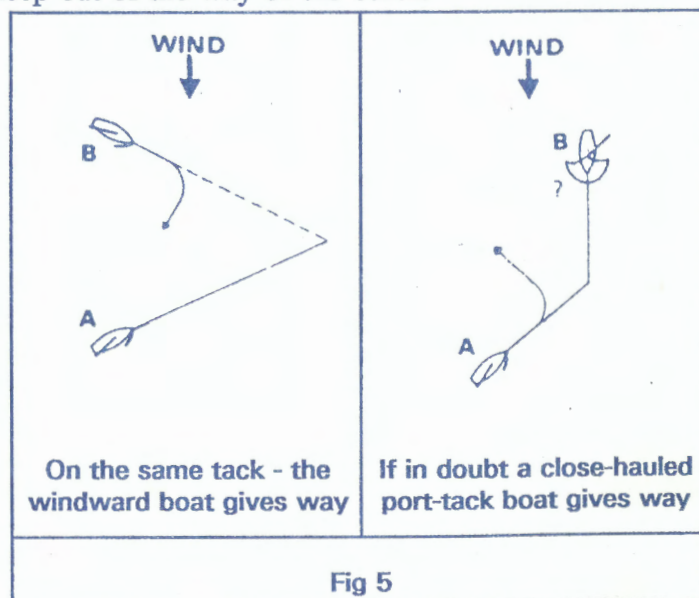
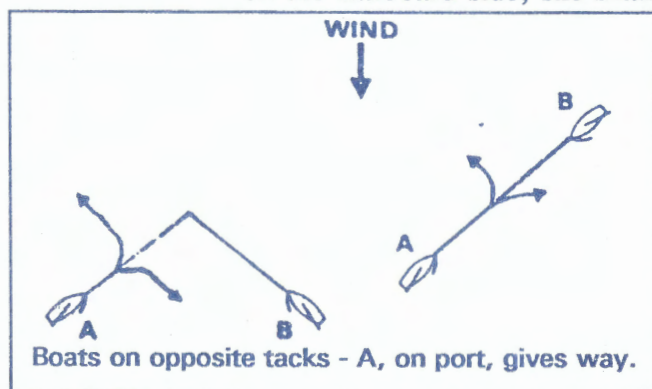
When two ships meet almost end-on, there is frequently a temptation to make a small alteration of course to avoid crossing ahead.



RULE 12

Sailing vessels

- a) When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows:
- i) When each has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other;
 - ii) When both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward;
 - iii) If a vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or on the starboard side, she shall keep out of the way of the other.



RULE 13

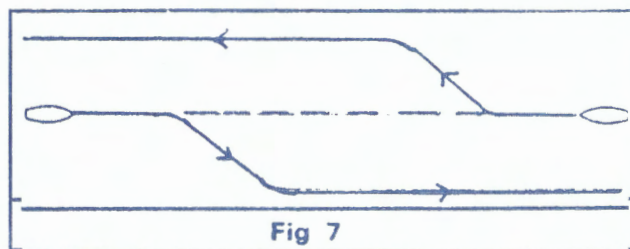
Overtaking

- a) Notwithstanding anything contained in the Rules of this Section any vessel overtaking any other shall keep out of the way of the vessel being overtaken. The overtaking sector is $22\frac{1}{2}$ abaft the beam on either side of the vessel being overtaken.

RULE 14

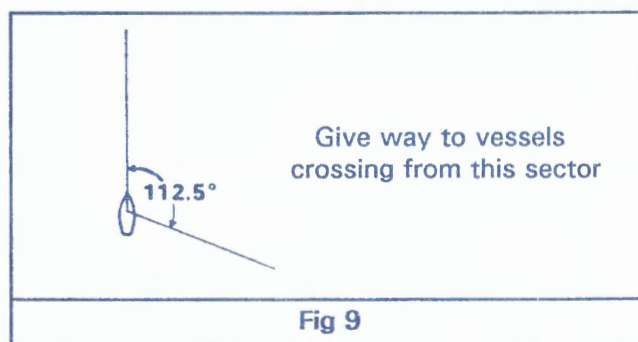
Head-on situation

- a) When two power-driven vessels are meeting on reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.

RULE 15

Crossing situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

RULE 17

Action by stand-on vessel

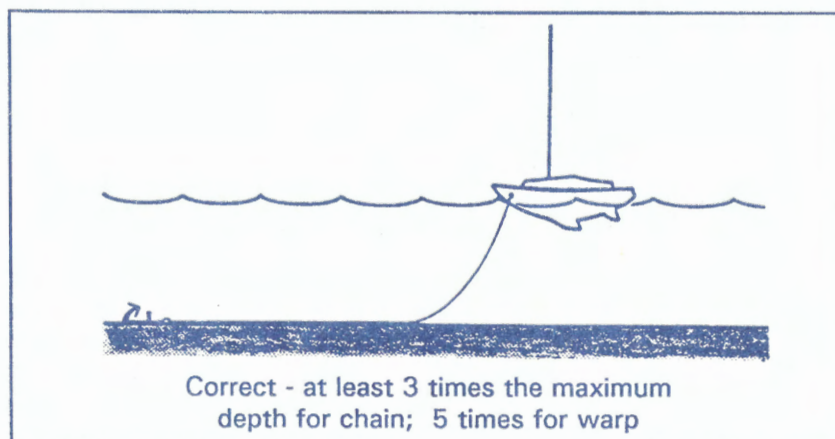
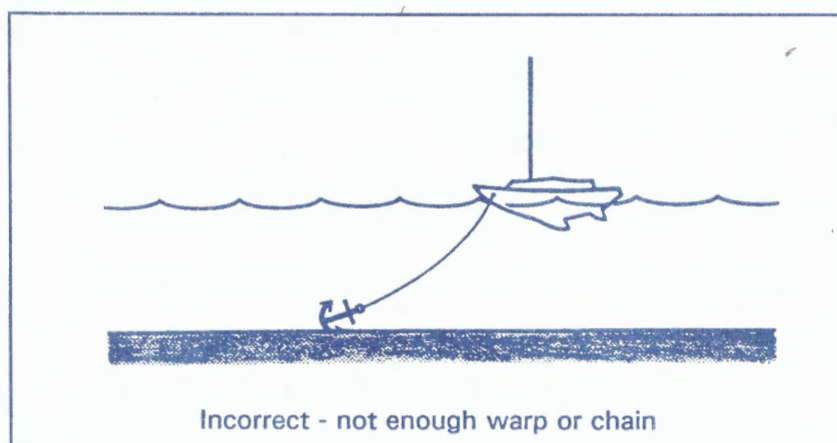
- a) i) Where one of two vessels is to keep out of the way the other shall keep her course and speed.
- ii) The latter vessel may however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.
- b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

RULE 19NOTE TO RULE 19:

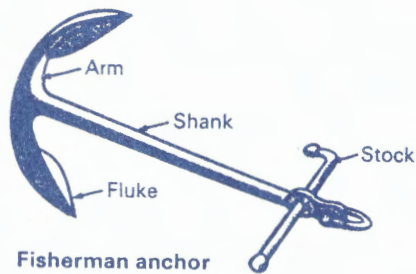
Fog at sea considerably increases the risk of collision. Radar has made it possible for a skilled operator to navigate a ship through fog with safety but it is by no means a panacea for all poor visibility problems. A misinterpreted radar picture can cause a collision, a collision which might never have happened if radar had not been used.

ANCHORING

1. Check the proposed area on the chart for potential danger.
2. Check the depth - 5 to 10 metres is sufficient.
3. Ensure that the area is protected from wind and waves. An onshore wind can be dangerous.
4. Prepare the anchor and sufficient line before sailing into the anchorage area.
5. Drop anchor making sure that at a full swing there are no obstructions.
6. Ensure that the anchor is well "dug-in".
7. Take a bearing on a prominent object and check the bearing periodically to see whether the anchor is dragging.



TYPES OF ANCHORS



1. FISHERMAN

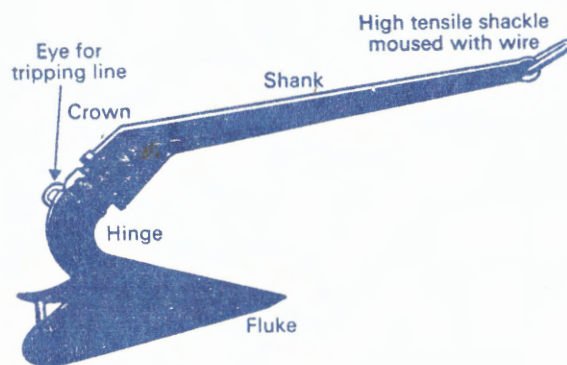
The traditional type of anchor is shown in Fig 10.1(a), and is sometimes called an Admiralty Pattern anchor.

Advantages

1. Can be stowed flat.
2. Good holding power in sand and mud.
3. Few moving parts to get fouled up or nip fingers.

Disadvantages

1. A heavier anchor needed than some other types to give equal holding power.
2. When stowed on deck, the flukes can do damage in heavy seas unless well secured.
3. Because there is a vertical fluke when it is on the seabed, there is a possibility of the anchor chain or warp fouling this, or the boat settling .



(c) CQR

2. CQR

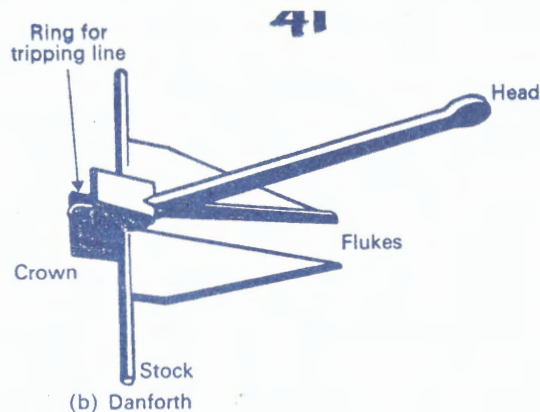
The CQR is a proprietary type of anchor and shown in Fig 10.1(b). It is sometimes also called a plough. Imitations are often not as good.

Advantages

1. Holds well in soft sand and mud.
2. Lighter anchor required than a Fisherman to give equal holding power.
3. Usually digs in well unless the point impales a tin (filling the hollow portion with lead adds extra weight and encourages it to dig into the seabed).

Disadvantages

1. There may be stowage difficulties, and special chocks are needed to secure it unless fitted over the bow roller.
2. Movable parts can become fouled and damage the fingers.
3. Can capsize.
4. Can be difficult to break out of mud unless a tripping line is used.
5. Does not hold too well in kelp or hard sand.



3. **DANFORTH**

The Danforth is a flat twin fluke anchor with the stock built into the head; Fig 10.1(c).

Advantages

1. Good holding power in sand and mud.
2. Less weight needed to equal holding power compared with a Fisherman, but about equal to a CQR.
3. Can be stowed flat.

Disadvantages

1. Movable parts can become fouled and can damage the fingers.
2. Not too good in rock.
3. Can be difficult to break out of mud unless a tripping line is used.



4. **BRUCE**

Advantages

1. A much lighter anchor needed to equal the holding power of the other types.
2. No movable parts.
3. Digs well into the seabed however it lies, and quickly buries itself.
4. Good holding power in sand and mud.
5. Easy to break out.

Disadvantages

1. Difficult to stow without a special chock which, due to lack of space on the foredeck, cannot always be fitted. It can, however, be stowed over the bow roller if well secured.

5. GRAPNEL

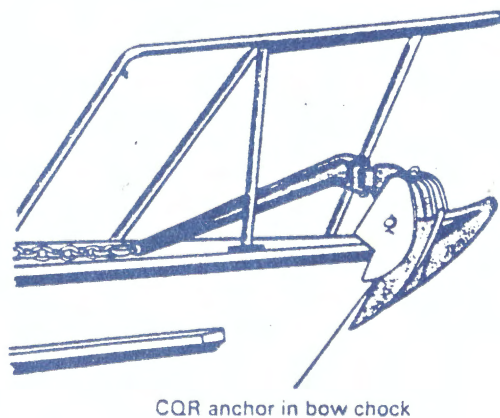
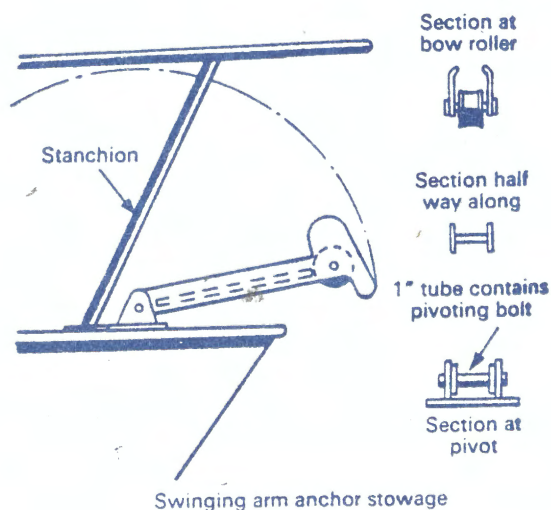
A good anchor to hold on rock and useful to use as a kedge.

6. KEDGE

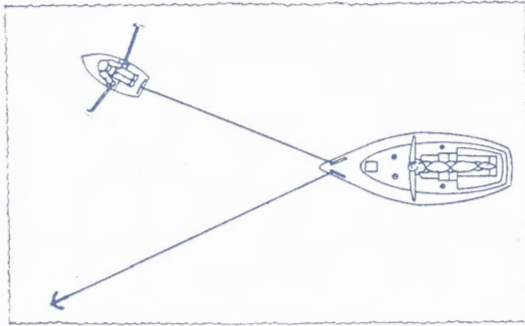
A small version of one of the anchors described above used for temporarily anchoring (when racing), for emergencies or for assisting the main anchor.

TABLE OF RECOMMENDED ANCHOR WEIGHTS AND ANCHOR ROPE SIZES

Tonnage displacement	Fisherman (stock type) anchor	C.Q.R. (plough type) anchor	Danforth anchor	Chain (short link)	Nylon rope
tons	lb	lb	lb	dia, in.	dir., in.
Up to 5	40 (18 kg)	35 (16 kg)	30 (14 kg)	1/4 (6mm)	1 1/2 (38mm)
5-8	45 (20 kg)	35	30	5/16 (8mm)	1 3/4 (45mm)
8-10	50 (22 kg)	35	30	3/8 (10mm)	2 (52mm)
10-15	60 (27 kg)	35	30	3/8	2 1/4 (58mm)
15-20	70 (32 kg)	45 (20 kg)	40 (18 kg)	7/16 (12mm)	2 1/2
20-28	80 (36 kg)	45	40	7/16	2 1/2 (65mm)
28-35	100 (45 kg)	45	40	1/2 (13mm)	2 1/2
35-40	120 (54 kg)	60 (27 kg)	65 (30 kg)	1/2	2 3/4 (70mm)
40-45	130 (60 kg)	60	65	9/16 (15mm)	2 3/4

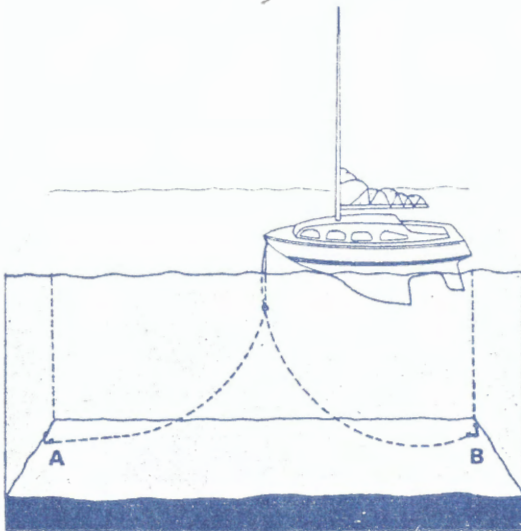


ANCHORS, WARPS AND MOORING GEAR

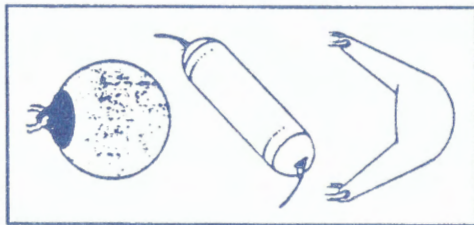


Having dropped and set the main anchor, the kedge can be laid from the tender.

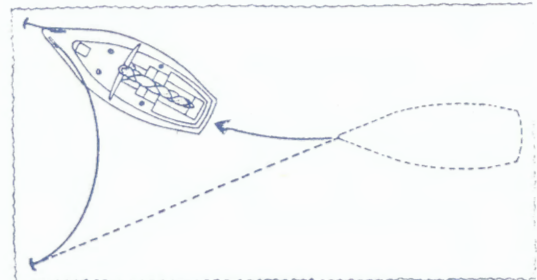
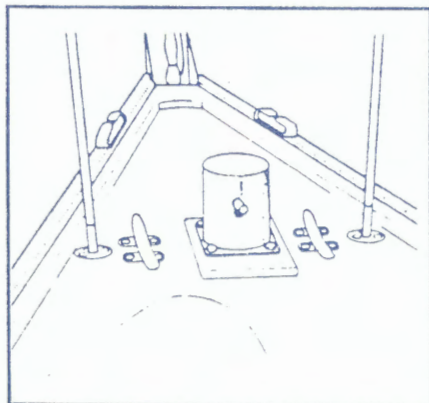
The main and the kedge anchors (A and B respectively) have been laid. The kedge cable is joined to the main cable with a rolling hitch and the join lowered well below the keel.



FENDERS

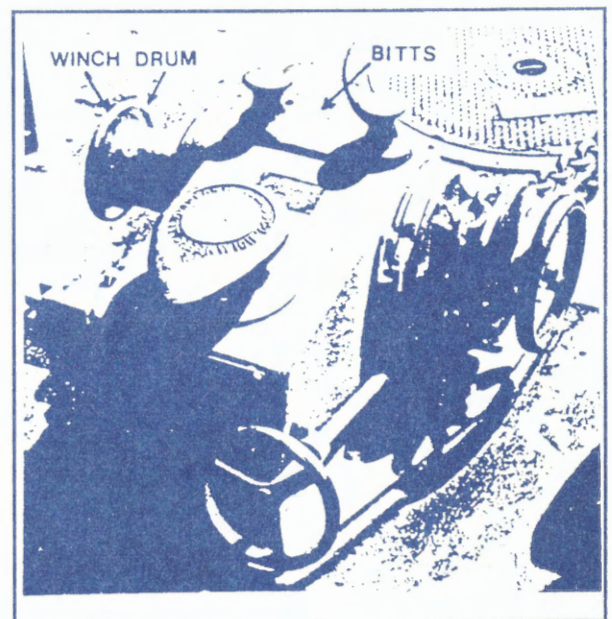


TOWING BOLLARD

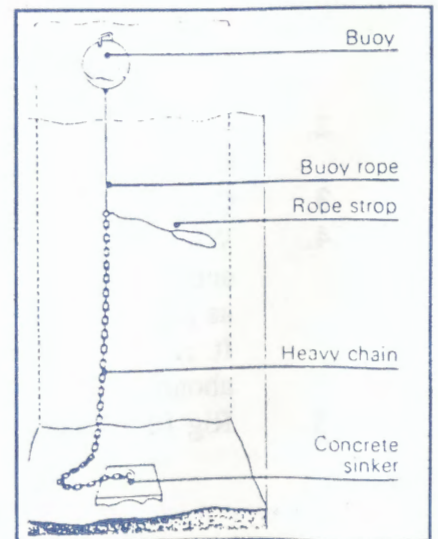


Drop the main anchor as usual (see opposite) and allow the boat to drop back to set the anchor. Motor forwards at an angle of about 45° to the line of the first anchor and drop the kedge abeam of it. Allow the boat to drift back and adjust the cables.

WINDLASS



YACHT MOORING



BERTHING

Unless on a floating pontoon, when berthing alongside there must be sufficient rope to allow for the rise and fall of the tide; Fig 10.4. The ropes used for berthing will depend upon the size and type of the boat and the local conditions.

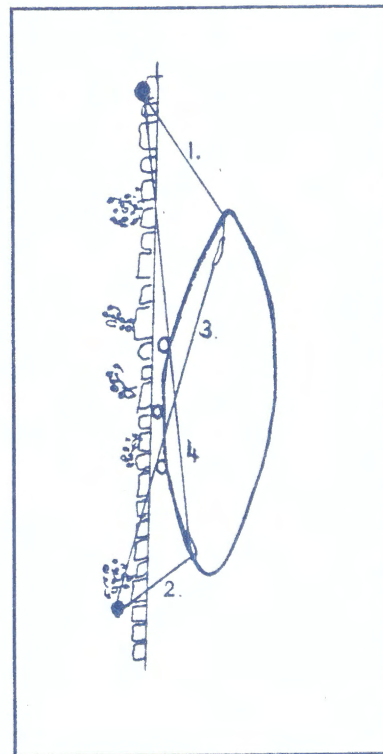
Bow line. A rope from the bows of the boat leading forward.

Stern line. A rope from the stern of the boat leading aft.

Breast ropes. Ropes abreast of the boat from the bows and the stern, these keep the boat into the berth; they should be slightly slack.

Springs. Diagonal ropes from the bows leading aft and from the stern leading forward, these stop the boat moving fore and aft and should be taut.

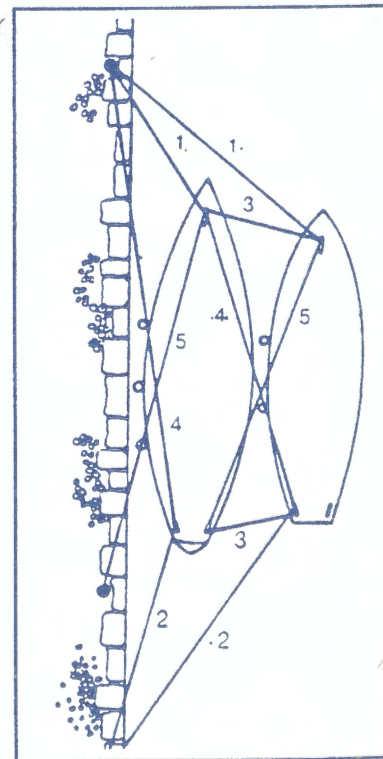
1. Bow line
2. Stern line
3. Bow Spring
4. Stern Spring



1. Bow Line
2. Stern Line
3. Breast Line
4. Stern Spring
5. Bow Spring

Points to remember when making fast alongside are:

1. If lying alongside another boat for more than half an hour, ropes from the bow and stern should be put directly ashore (many harbour authorities require this to be done). It is unwise to rely on the other boat's ropes especially if she is smaller, also if she wishes to leave before the outer boat she can then easily do so.
2. Adequate fenders must be placed between boats or between the boat and the pontoon.
3. Crosstrees should be staggered to avoid clashing in a swell.
4. When crossing another boat's deck this should be done across the bow section and not across the cockpit, as quietly as possible, taking care not to tramp dirt or mud across it. It is courteous to seek permission first if the owner is aboard.
5. Rig frapping lines to prevent halyards slapping the mast.



DAY THREENOTES:

MAN OVERBOARD ROUTINE**DO NOT PANIC!**

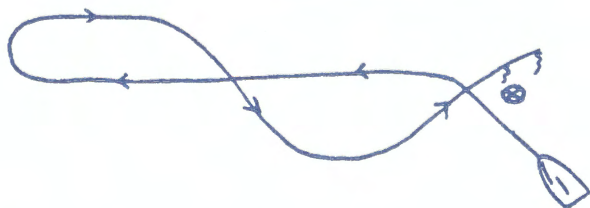
1. Shout "MAN OVERBOARD".
2. Throw over lifebuoy - Dan Buoy etc.
3. Call all crew.
4. Get on a BEAM REACH.
5. Detail one crew to keep man in sight at all times and count to measure distance sailed.
6. Get the boat under control. (Douse spinnaker, drop headsail if necessary, prepare boarding gear).
7. Start motor (check no lines overboard).
8. After ± 100 metres bear up and go about. (Lookout begins count again and keeps person in sight at all times.)
9. "Beam Reach" along reciprocal course.
10. Approach man from "Leeward". "Let Fly" to stop yacht and turn into "no go zone" to Luffup.
11. Throw line to man in water. Bring him aboard to "Leeward" as the boat lies "ahull".

NOTE:

1. Throwing line (rope with Bowline in). Boarding ladder essential.
2. If man is unconscious, lower Mainsail into water and hoist aboard using Halyard.

MAN OVERBOARD ROUTINE:

This is the worst accident that can happen while sailing.

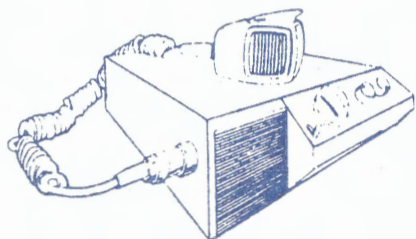
REMEMBER: DO NOT PANIC

Whatever point of sailing you are on always get on to a BEAM REACH.

If your one and only crew is overboard, then get on to a Beam reach, sail away for ± 100 metres, go about, and go back to him on a hove-to position.

SAFETY EQUIPMENT : VITAL ODDS AND ENDS

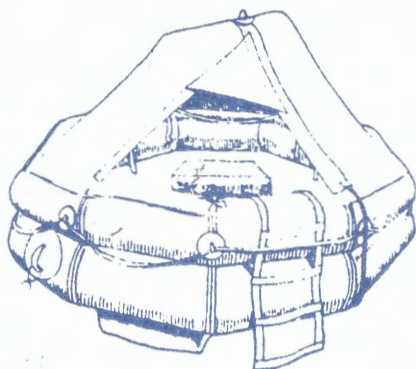
1.



1. VHF RADIO: This operates on line of sight only.

SSB RADIO: Range from 1500 miles
KNOT METER and SUM LOG
DEPTH SOUNDER or LEAD LINE
RADIO DIRECTION FINDER
RADAR

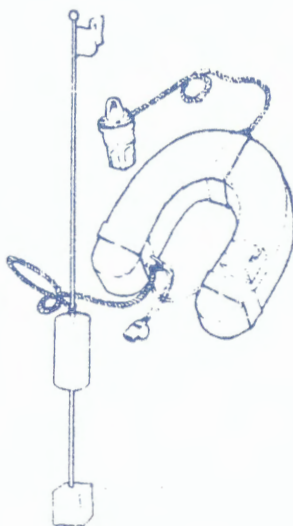
2.



2. LIFE RAFT: (Avon, Beaufort, R.F.D., Zodiac, Winslow, Switick, Givens) All stationary units.

Sigler is a sailing liferaft.

3.



3. HORSESHOE LIFEBOUY with FLASHING LIGHT DANBUOY ATTACHED WHISTLE TO ATTRACT ATTENTION

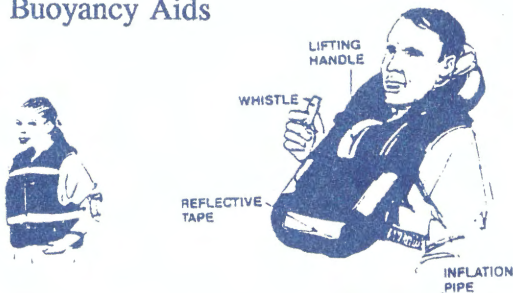
4.



4. SAFETY HARNESS essential for HEAVY WEATHER WORK or if ALONE ON WATCH



5. Life Jackets and Buoyancy Aids



1. Inflatable life-jackets
2. Buoyancy jackets with foam built in.



6. E.P.I.R.B.

Emergency Position Indicating Radio Beacon. Emits a very high frequency signal which can be picked up over long distances by other vessels and aircraft.

7. Flares



Pyrotechnic Distress Signals

1. Hand flare
2. Orange smoke
3. Parachute flare (can be seen over the horizon)

8. Fire Extinguishers



Two types:

1. Dry powder
2. Halon or BCF

Both can be used on any fire on board a boat. Fire needs HEAT, FUEL and OXYGEN. Cut any one of these and the fire goes out.

9. Reference Library

Emergency Navigation
Sailing Directions, etc.
Galley Cookbook

DISTRESS SIGNALS

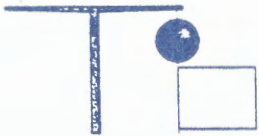
1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance:
 - a) A gun or other explosive signal fired at intervals of about one minute;
 - b) A continuous sounding with any fog-signalling apparatus;
 - c) Rockets or shells, throwing red stars fired one at a time at short intervals;
 - d) A signal made by radiotelegraphy or by any other signalling method consisting of the group ...---... (SOS) in morse code;
 - e) A signal sent by radiotelephone consisting of the spoken word "MAYDAY";
 - f) The international code signal of distress indicated by N.C.;
 - g) A signal consisting of a square flag having above or below it a ball or anything resembling a ball;
 - h) Flames on the vessel (as from a burning tar barrel, oil barrel, etc);
 - i) A rocket parachute flare or a hand flare showing a red light;
 - j) A smoke signal giving off orange-coloured smoke;
 - k) Slowly and repeatedly raising and lowering arms outstretched to each side;
 - l) The radiotelegraph alarm signal;
 - m) The radio telephone alarm signal;
 - n) Signals transmitted by emergency position-indicating radio beacons.

2. The use or exhibition of any of the foregoing signals except for the purpose of indicating distress and need of assistance and the use of either signals which may be confused with any of the above signals is prohibited.

3. Attention is drawn to the relevant sections of the International Code of Signals, the Merchant Ship Search and Rescue manual and the following signals:
 - a) a piece of orange-coloured canvas with either a black square or circle or other appropriate symbol (for identification from the air);
 - b) a dye marker.

Distress Signals

Note: Only to be used if the vessel is in serious and immediate danger, and help is urgently required

 (a) A gun or other explosive signal fired at intervals of about one minute	 (g) A signal consisting of a square flag having above or below it a ball or anything resembling a ball
 (b) A continuous sounding with any fog-signalling apparatus	 (h) Flames on the vessel (as from a burning tar barrel, oil barrel etc)
 (c) Rockets or shells, throwing red stars fired one at a time at short intervals	 (i) A rocket parachute flare or a hand flare showing a red light
 (d) A signal made by radiotelegraphy or by any other signalling method consisting of the group ... - - - - (SOS) in the Morse Code	 (j) A smoke signal giving off orange-coloured smoke
 MAYDAY, MAYDAY, MAYDAY (e) A signal sent by radiotelephony consisting of the spoken word 'MAYDAY'	 (k) Slowly and repeatedly raising and lowering arms outstretched to each side
 (f) The International Code signal of distress indicated by 'NC'	(l) The radiotelegraph alarm signal (a series of 12 four-second dashes with intervals of one second) (m) The radiotelephone alarm signal (two audio tones transmitted alternately at 2200 Hz and 1300 Hz, for a duration of 30-60 seconds) (n) Signals transmitted by EPIRBs (either as in (m) or a series of single tones at 1300 Hz)

INFORMATION AND PROCEDURE ON V.H.F. RADIO FOR YACHTSMEN

THE STANDARD PHONETIC ALPHABET

Whilst there are, and have been, numerous ways of identifying with certainty the letters of the alphabet, the one set out below was worked out by an International Committee as being the most suitable for pronunciation by operators of many different nationalities, tongues and accents.

<u>Letter</u>	<u>Phonetic</u>	<u>Spoken as</u>
A	ALPHA	ALFAH
B	BRAVO	BRAHVOH
C	CHARLIE	CHARLEE or SHARLEE
D	DELTA	DELLTAH
E	ECHO	ECKOH
F	FOXTROT	FOKSTROT
G	GOLF	GOLF
H	HOTEL	HOHTELL
I	INDIA	INDEEAH
J	JULIETT	JEWLEE-ETT
K	KILO	KEYLOH
L	LIMA	LEEMAH
M	MIKE	MIKE
N	NOVEMBER	NOVEMBER
O	OSCAR	OSSCAH
P	PAPA	PAHPAH
Q	QUEBEC	KEHBECK
R	ROMEO	ROWMEOH
S	SIERRA	SEEAIRRAH
T	TANGO	TANG-GO
U	UNIFORM	YOUNEEFORM or OONEEFORM
V	VICTOR	VIKTAH
W	WHISKEY	WISSKEY
X	X-RAY	ECKSRAY
Y	YANKEE	YANKEE
Z	ZULU	ZOOLOO

PHONETIC NUMERALS

When numerals are transmitted by radiotelephone the following rules for their pronunciation should be observed.

<u>NUMERAL</u>	<u>SPOKEN AS</u>
1	WUN
2	TOO
3	TREE
4	FOWER
5	FIFE
6	SIX
7	SEV-EN
8	AIT
9	NIN-ER
0	ZERO

DISTRESS AND URGENCY BY VHF RADIO

DISTRESS: A distress message indicates the yacht is threatened by grave and imminent danger and requests immediate assistance. It has priority over all other transmissions.

"MAYDAY MAYDAY MAYDAY"

"THIS IS - *Yacht's Name* - *Yacht's Name*"

Followed by the message which begins: "MAYDAY - *Yacht's Name*"

Followed by the vessel's position, the nature of the distress and any other important information to facilitate rescue.

Followed by:

"OVER" (the invitation to reply)

Then release the "Press-to-speak" switch and listen.

URGENCY: A very urgent message concerning the safety of a ship or a person has priority over all other communications, except distress, and should be preceded by:

"PAN PAN PAN PAN PAN PAN"

"HELLO ALL STATIONS ALL STATIONS ALL STATIONS"

"THIS IS - *Yacht's Name* - *Yacht's Name* - *Yacht's Name*"

Followed by the message which should begin with the yacht's position (given as for a distress message) and the assistance required.

Followed by:

"OVER" Then listen.

ASSISTANCE TO OTHERS: If you see or hear a distress signal you must proceed with all speed to the assistance of the persons in distress. Switch to Channel 16 and listen. If your transmission will not interfere with distress traffic, call the Coastguard, or the nearest Coast Radio Station, to report your position, what you have seen and your intentions. Then remain tuned to Channel 16. If it is necessary to speak to other vessels in the vicinity and after calling and receiving an acknowledgment on Channel 16, transfer to Channel 6 for scene-of-search intership traffic.

SAFETY: In the UK Channel 67 is used for messages between HM Coastguard and small craft on non-immediate ship safety or navigational safety matters. Call the Coastguard on Channel 16 and say you have a safety message. You will be asked to transfer to Channel 67 to pass your message.

VHF RADIO - TEN GOLDEN RULES

1. Listen and think before transmitting.
2. When two ships are establishing contact, it is normally the ship called which names the channel to be used for working. Always await acknowledgment before changing channel.
3. Although Channel 16 is the distress and safety channel, it is also used for calling. However, always call on a working channel if one is known to be watched.
4. Except for distress and urgency traffic Channel 16 must not be used for the exchange of messages.
5. Use low power for transmitting, whenever it will give satisfactory communication.
6. When a call is complete, and subsequently during an exchange of messages, a station invites a reply by saying: "OVER".
7. Where a message is received and acknowledgment only is needed, say "RECEIVED". Where it is necessary to confirm that the information is correct and/or understood, say: "RECEIVED - UNDERSTOOD" and repeat the substance of the message if considered necessary.
8. The end of work is indicated by each station adding "OUT" at the end of its last reply.
9. When conditions are good, abbreviated procedures may be used:
 - i) Repetition of words and phrases should be avoided;
 - ii) At the end of work only one station need use "OUT"; the other station needs not reply.
10. When the traffic is complete ensure that the press-to-speak switch is properly released and that a carrier wave is not being transmitted when the microphone is in its cradle.

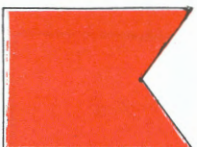
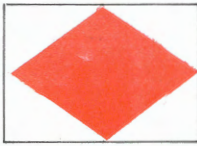
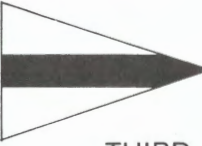
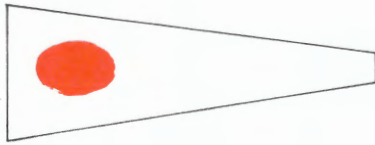
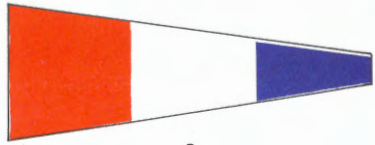
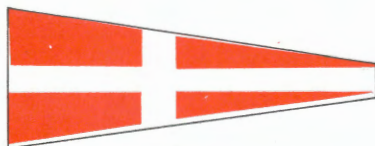
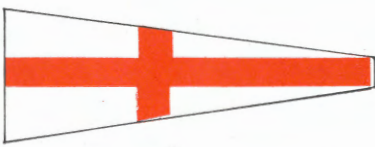
NOTE: A separate exam must be written through the G.P.O. in order to obtain a Radiotelephone licence.

corresponds to single red light on mast - FLAG CODES

- A ✓ I have a diver down, keep well clear at slow speed.
- B ✓ I am taking in, or discharging, or carrying dangerous goods.
- C ✓ Yes (affirmative of "The significance of the previous group should be read in the affirmative").
- D Keep clear of me, I am manoeuvring with difficulty.
- E I am altering my course to starboard.
- F I am disabled, communicate with me.
- G ✓ I require a pilot. When made by fishing vessels operating in close proximity of the fishing grounds, it means - I am hauling.
- • H ✓ I have a pilot on board. - Red light, vessel going out
- • I ✓ I am altering my course to port. - Green light, vessel coming in
- J I am on fire and have dangerous cargo on board, keep well clear of me.
- K I wish to communicate with you.
- L You should stop your vessel instantly.
- M My vessel is stopped and making no way through the water.
- N ✓ No (negative of "The significance of the previous group should be read in the negative"). This signal may be given only visually or by sound.
- O Man overboard.
- • P ✓ In Harbour - All persons should report on board as the vessel is about to proceed to sea. - Port closed
At Sea - It may be used by fishing vessels to mean "My nets have come fast upon an obstruction".
- Q My vessel is "healthy" and I request free pratique.
- actually, no - R Request, i.e. Rover Y - request other boats to reduce speed and keep watch
- S My engines are going astern.
- T Keep clear of me, I am engaged in pair trawling.
- U You are running into danger.
- V ✓ I require assistance.
- W ✓ I require medical assistance.
- X Stop carrying out your intentions and watch for my signals.
- Y I am dragging anchor.
- Z I require a tug.
When made by fishing vessels operating in close proximity on the fishing grounds, it means - I am shooting nets.

NOTES:

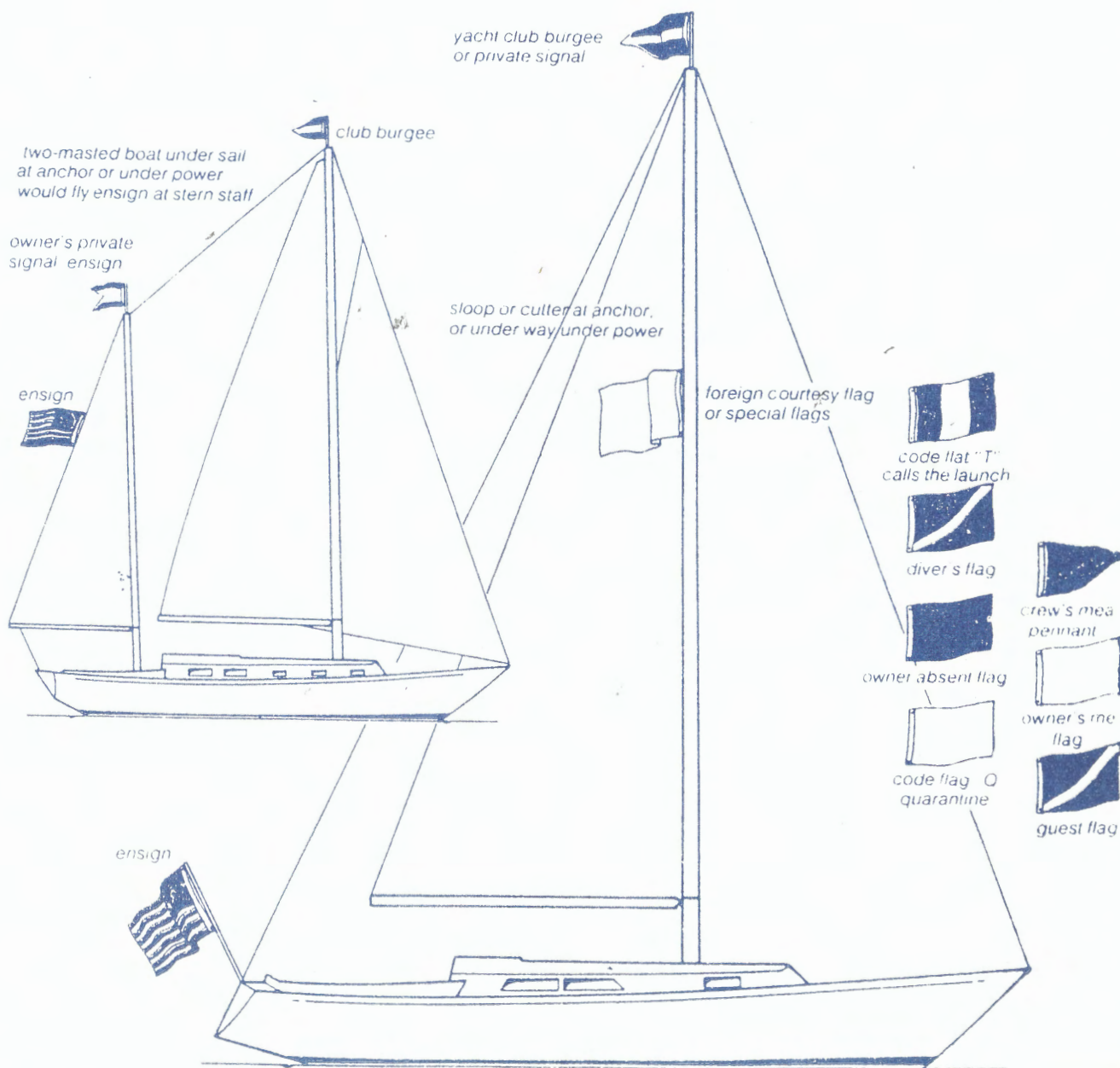
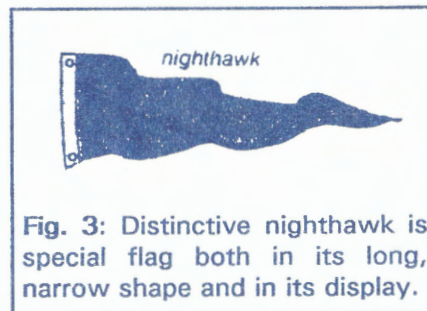
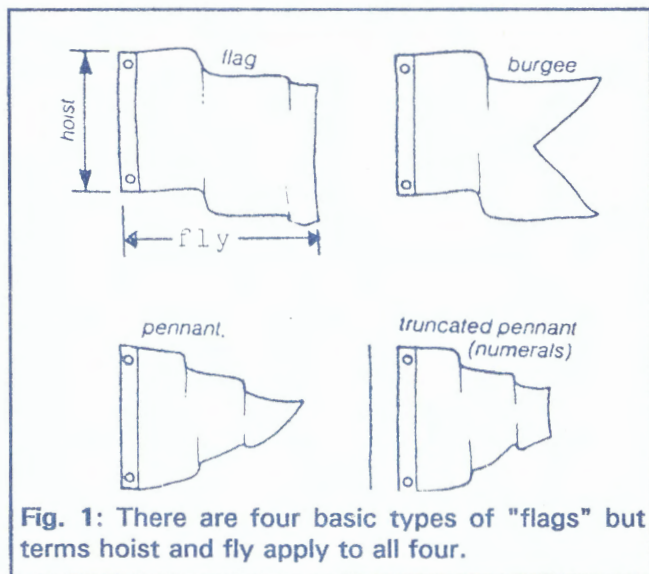
1. Signals of letters marked • when made by sound may only be made in compliance with the requirements for the International Regulations for Preventing Collisions at Sea. Rules 15 and 28.
2. Signals "K" and "S" have special meanings as landing signals for small boats with crews or persons in distress (International Convention for the Safety of Life at Sea. 1960 Chapter V Regulation 16).

 A	 B	 C	 D	 E
 F	 G	 H	 I	 J
 K	 L	 M	 N	 O
 P	 Q	 R	 S	 T
 U	 V	 W	 X	 Y
 Z	 FIRST  SECOND  THIRD SUBSTITUTES			
 1	 2	 3		
 4	 5	 6		
 7	 8	 9		
 0	 CODE SIGNAL AND ANSWERING PENNANT			



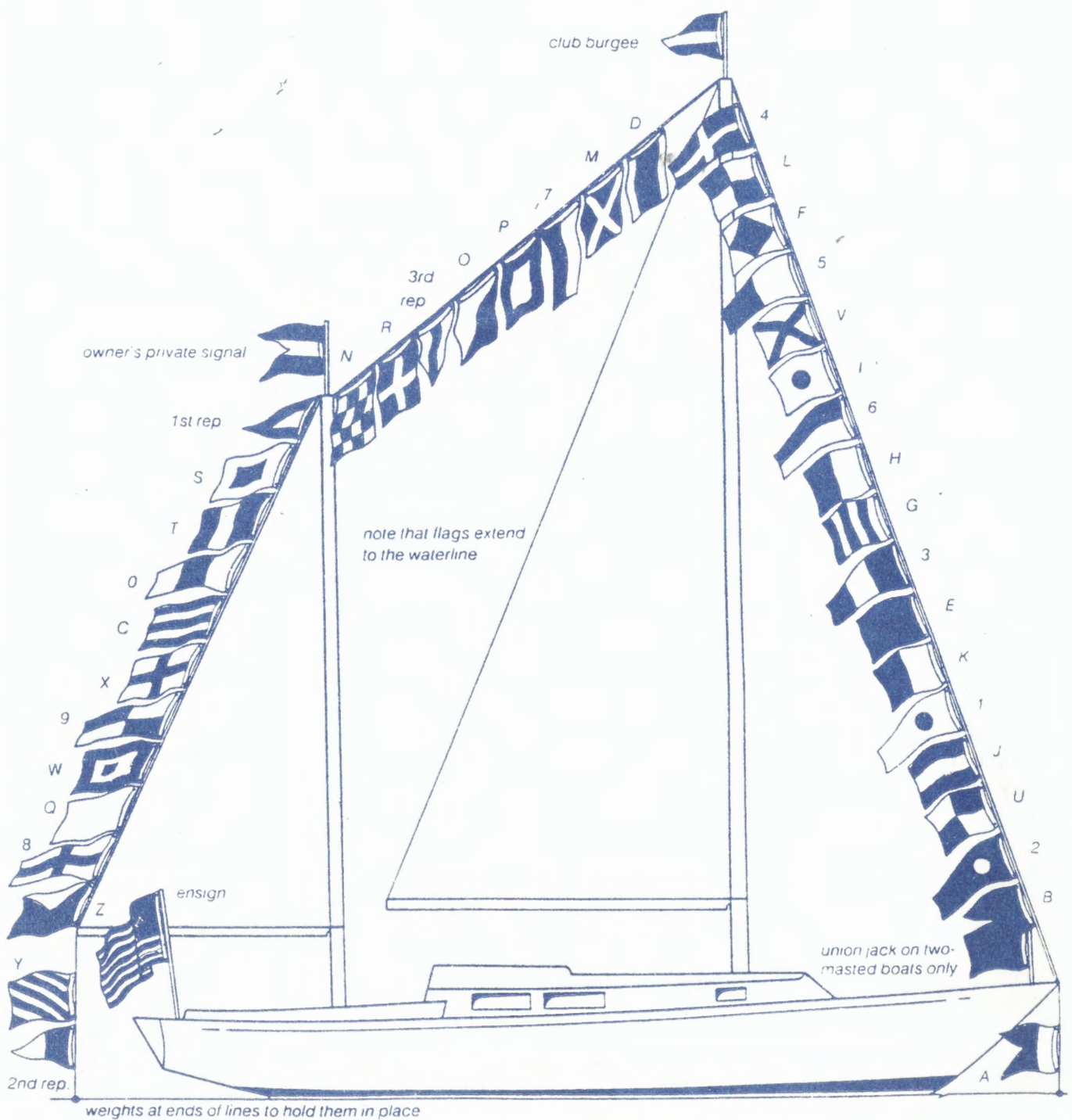
A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y
Z	SUBSTITUTES			
	FIRST	SECOND	THIRD	
1	2	3		
4	5	6		
7	8	9		
0	CODE SIGNAL AND ANSWERING PENNANT			

FLAGS - ETIQUETTE



FLAGS - ETIQUETTE (contd.)

Fig. 4: Special festive occasions and national holidays are appropriate times to dress ship, flying international code flags



FIRST AID

It is advisable to purchase a First Aid Manual and familiarize yourself with the treatment of common ailments and wounds before any journey. A comprehensive First Aid Kit should be stored in a watertight container with clear labels and instructions.

Common Ailments on Yachts:

1. Colds, influenza
2. Stomach disorders
3. Cuts and Abrasions
4. Blows and concussion
5. Shock (after any serious injury)
6. Burns - from galley
7. Alkali and acid burns
8. Dislocations, strains and fractures
9. Sunstroke and Sunburn
10. Seasickness
11. Heart attack
12. Hypothermia
13. Drowning

SEASICKNESS

A complaint from which few sailors escape! Seasickness is not a stomach disorder, it is a problem of balance.

Preventative Measures

Avoid rich foods and excessive alcohol beforehand, limit your liquid intake and eat dry foods. However, it is a fallacy that an empty tummy will prevent seasickness. Keep busy and concentrate on a job. If you feel queasy lie down as soon as possible. Moving about down below tends to make you feel worse. There are a number of drugs available to help control seasickness, the user has to experiment to find an effective remedy. Some of the drugs make you feel drowsy and most take a couple of hours to be effective. It's no use waiting until you are seasick to take tablets as they won't stay down long enough to work.

HYPOTHERMIA

One of the biggest dangers to sailors is the cold. Hypothermia occurs when the cold gets transferred to the body core, the body has lost all its heat. How long the process takes depends on physical condition, age, and bodyweight. The remedy for hypothermia is to warm the body slowly - blankets and a sweet warm drink will start the process. No alcohol.

Symptoms of Hypothermia

1. Uncontrollable shivering and difficulty in speaking
2. Shivering decreases. Lack of co-ordination. Thinking muddled.
3. Muscles cease to function, pulse and respiration slowed.
4. Unconsciousness, heartbeat erratic.
5. Brain cells, heart and lungs stop functioning - Death.

EXAMPLE OF FIRST AID KITS

First Aid Kit (general)

Painkillers (aspirin or equivalent and a stronger variety) : calamine lotion : throat lozenges : sea-sickness tablets : salt tablets : antiseptic (liquid and cream) : anti-insect bite cream sun barrier cream : sodium bicarbonate : eye wash and bath : thermometer : scissors : safety pins : steri-strips: eye dressing or patch (gauze) : plasters : first aid tape : gauze dressings bandages - narrow cotton and wide stretch crepe : cotton wool : non-adhesive dressing.

First Aid Kit (emergency)

Steri-strips : surgical scissors and gloves : safety razor : surgical tape : gauze pads : plaster bandages and gauze bandage roll : cotton bandages : safety pins : dressing - sterile and vaseline gauze (for burns) : alcohol : local anaesthetic spray splints : space blanket.

HYPOTHERMIA

WHAT IS IT? A condition in which exposure to cold air and/or water lowers body core temperature. Death can result from too low a brain and heart temperature.

WHY BE CONCERNED? Hypothermia, even mild cases, decreases crew efficiency and increases risk of costly accidents. Smart planning against hypothermia can give a winning competitive edge. Be a **WARM WINNER**, not a **COOL LOSER**.

PREVENTION

- Wear warm clothing and a PFD (Personal Flotation Device). Have survival suits available for crew. Insulate all areas of the body, especially the high heat-loss areas: head, neck, armpits, sides of chest, and groin. Keep warm and dry, but avoid sweating; wear layered clothes
- Rotate watch frequently
- Get plenty of rest, prevent fatigue
- Drink hot soup and sweet drinks for energy; *no alcohol*
- Prevent dehydration; watch urine color (drink more if color becomes more intense)
- Avoid seasickness
- Consider special medical problems of crew members
- Have proper below-deck accommodations for cold and rough weather
- Require that two or more of the crew be trained in CPR (cardio-pulmonary resuscitation)
- Have low-temperature rectal thermometer in first-aid kit

SURVIVAL

- **If boat is in trouble**, get into survival suits or float coats. Radio for help: give position, number of crew, injuries, boat description. Make visual distress signals. Keep survival suits on until trouble ends. Stay below if possible. Remain aboard until sinking inevitable.
- **If going overboard**, launch life raft and EPIRB (Emergency Position Indicating Radio Beacon). Take visual distress signals with you. Get into raft, stay out of water. Remain near boat.
- **If in the water**, crew should stay together near boat. This makes everyone easier to find, and helps morale. Enter life raft, keep survival suit on.
- **If not wearing survival suits**, keep clothes and boots on for some insulation and flotation. Keep hat on to protect head. Get all or as much of body out of water as soon as possible — into raft, swamped boat, flotsam. Avoid swimming and treading water, which increase heat loss. **Minimize exposed body surface:** use H.E.L.P. and HUDDLE positions when possible.

H.E.L.P.

(Heat Escape Lessening Posture)



- Head out of water, including back of head
- Arms against sides, chest and PFD
- Lower legs crossed, knees raised as much as waves and stability permit, but **keep knees together**

HUDDLE — Two or more crew holding together

- Heads out of water, including back of heads
- Arms hugging each other over PFDs
- Maximum body contact, especially at chest, reducing heat loss
- Legs intertwined as much as possible
- Talk to maintain morale



REMEMBER:
NO ONE IS A SURVIVOR UNTIL RESCUED.
KEEP CALM. MAKE YOURSELF VISIBLE.

Prepared in cooperation with:
Sea Grant Marine Advisory Service, University of Rhode Island, Narragansett, RI, U.S.A.
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RANGES OF HYPOTHERMIA SYMPTOMS

Note: Most physical symptoms vary with each individual and may be unreliable indicators of core body temperature. Only a low-temperature rectal thermometer gives reliable core temperature (the mouth cools too rapidly). In general, as body temperature falls, symptoms will increase.

MILD CONDITION

(36-34°C, 97-93°F)

- Shivering, cold hands and feet
- Still alert and able to help self
- Numbness in limbs, loss of dexterity, clumsiness
- Pain from cold

MODERATE CONDITION

(34-32°C, 93-90°F)

- Shivering may decrease or stop

SEVERE CONDITION

(32-28°C, 90-82°F)

- Shivering decreases or stops
- Loss of reasoning and recall, confusion, abnormal behavior
- Victim appears drunk; very clumsy, slurs speech, denies problem and may resist help
- Victim semiconscious to unconscious
- Muscular rigidity increasing

CRITICAL CONDITION

(28°C, 82°F and below)

- *Unconscious*, may appear dead
- Little or no apparent breathing
- Pulse slow and weak, or no pulse found
- Skin cold, may be bluish-gray color
- Eyes may be dilated
- Very rigid



United States Yacht Racing Union

HYPOTHERMIA FIRST AID

ALL CASES

- Move victim to dry shelter and warmth
- Handle gently
- Remove wet clothes — cut off if necessary
- Apply mild heat (comfortable to your elbow) to head, neck, chest and groin — use hot water bottles, warm moist towels
- Cover with blankets or sleeping bag; insulate from cold — keep head and neck covered

MILD CASES

- Primary task is to prevent further heat loss and allow body to rewarm itself
- Give warm, sweet drinks — *no* alcohol
- Apply gentle heat source to stabilize temperature
- Exercise to generate heat
- Keep victim warm for several hours

MODERATE CASES

- Same as above
- Limit exercise
- Offer sips of warm, sweet liquids only after victim is *fully conscious*, begins to rewarm, and is able to swallow
- Have victim checked by doctor

SEVERE CASES

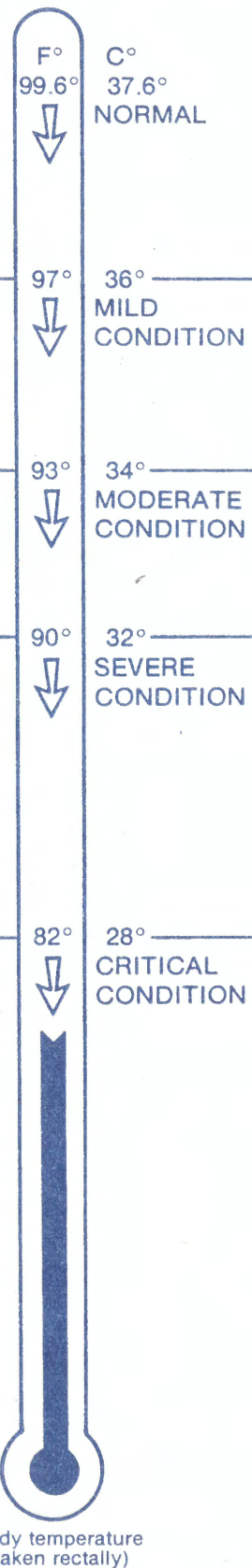
- Obtain medical advice as soon as possible using your radio
- Assist victim, but avoid jarring him — rough handling may cause cardiac arrest or ventricular fibrillation of heart
- No food or drink
- Ignore pleas of "Leave me alone, I'm O.K." *Victim is in serious trouble* — keep continuous watch over victim
- Treat as for shock — lay down in bunk, wedge in place, elevate feet, keep immobile
- Apply external mild heat to head, neck, chest, and groin — keep temperature from dropping, but avoid too rapid a temperature rise
- Transport soon, gently, to hospital

CRITICAL

- *Always assume patient is revivable — don't give up*
- Handle with *extreme* care
- Tilt the head back to open the airway — look, listen, and feel for breathing and pulse for *one to two full minutes*
- If there is any breathing or pulse, no matter how faint or slow, *do not give CPR*, but keep close watch on vital sign changes
- Stabilize temperature with external heat sources; also use naked chest-to-back warming by other crew member (leave legs alone), and/or use rescuer's warm breath exhaled in victim's face and in unison with his breathing
- If no breathing or no pulse for one to two full minutes, *begin CPR immediately*
- *Medical help imperative — hospitalization needed*

WARNING

- First aid for severe and critical hypothermia is to add heat to stabilize temperature only. Rapid rewarming may be fatal; it will, at least, cause complications. Allow body to rewarm itself slowly.
- Body core temperature lags behind skin temperature during rewarming. Keep victim protected for extended period after apparent full recovery or medical help arrives. Many hours, even days, are required for return to normal temperature. Avoid reexposure to cold.
- Always assume hypothermia is present in all man-overboards.
- In a helicopter rescue, protect victim — especially the head — from rotor blast wind chill.



PSYCHOLOGICAL FACTORS IN SEASICKNESS

PERHAPS THESE TIPS WILL HELP

Try not to think about seasickness, put it out of your mind, force yourself to think of other things.

Take heart and build up your confidence.

Practice releasing the tension in your muscles; as soon as you begin to feel apprehensive try and relax (desensitisation)

Avoid unpleasant smells (especially tobacco, damp clothing and vomit). Stay away from the galley.

Below deck: lie down, keep your eyes closed.

In the saloon: fix your eyes on a freely suspended object.

Seek out cool, fresh air and take calm, deep breaths.

Where possible keep away from enclosed spaces, go up on deck.

Reduce the amplitude of the motion stimuli: keep amidships or astern, avoid the fo'c'sle berth.

When standing, avoid leaning against anything, stand erect and make active compensatory movements to keep your balance.

Try to move your head as little as possible.

"Lock" onto the horizon; take the look--out duty.

Watch the swell and anticipate the movement of the waves.

Participate in the normal duties on board.

Take the helm.

At all events see a job through to the end, do not give up on it.

Get through a bout of seasickness actively. This speeds up the process of readaption.

Acknowledgments to: "Psychology of Sailing" by Michael Stadler
Professor of Experimental Psychology at
Bremen University.

DAY FOUR

NOTES:

PART TWO

A. BASIC NAVIGATION

INTRODUCTION TO CHARTS

What is a Chart?

A chart represents a section of the earth's surface on a flat sheet of paper. Because the earth is round (3 dimensional) it is impossible to flatten all sections without getting areas that are distorted. Imagine trying to flatten a tennis ball!

Every boat on passage needs to have sufficient up-to-date charts on board to cover the entire area of the proposed voyage. The chart gives information on dangers and aids safe pilotage and navigation. The boat's geographical position and course can be plotted onto the chart and updated regularly.

The scale gives the number of units measured on land or sea which are represented by one unit on the chart eg. 1:250 000 means 1cm on chart represents 250 000cm on land or sea. The scale of the chart required depends on how much detail the navigator needs. A small scale chart would be adequate for offshore navigation but it would not show enough detail regarding inshore dangers, anchorages and port entrances.

Charts are compiled by the hydrographic office of the navy and are available from selected chart agents - usually bookshops and suppliers of nautical equipment. A chart catalogue enables the navigator to determine which charts he requires. When charts are purchased from a chart agent they will be corrected up-to-date. Every week new corrections are published in the "Notices to Mariners" available free of charge from Chart Agents.

All the details necessary for safe navigation will be shown on the chart. To avoid clutter a lot of detail is abbreviated or indicated by symbols. An explanation of all chart symbols is found in the Symbols and Abbreviations publication.

Nautical Publications

Additional hydrographic and commercial publications for use with charts are also available from chart agents.

1. Tide Tables
2. List of Lights, Radio and Fog Signals
3. Sailing Directions
4. Nautical Almanacs
5. Pilotage Books

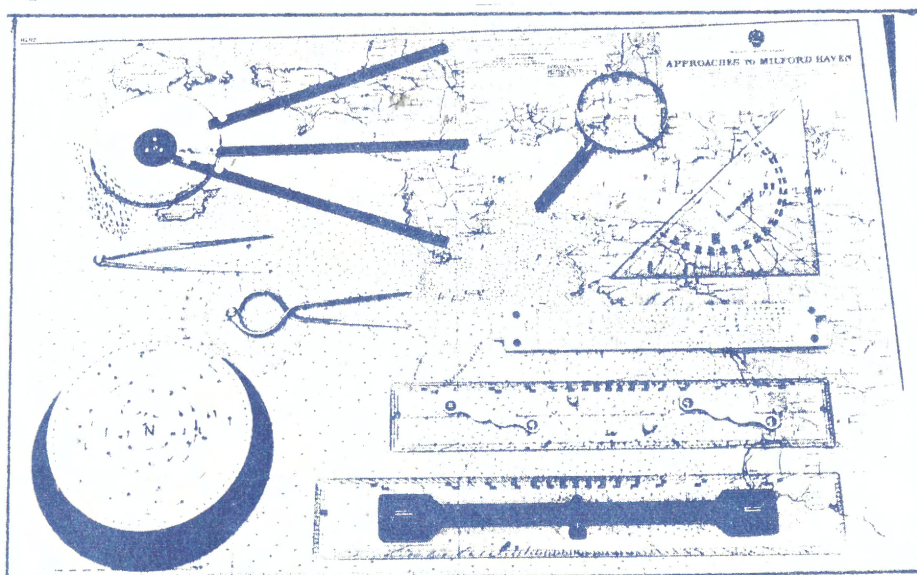
Chart Care

Navigational charts are expensive and care should be taken to prolong their life. They should be folded as little as possible as they wear very quickly along the creases. The fold can be reinforced with tape along the back of the chart. They should be stored flat in the chart table or folder. Too many charts stored together causes damage and confusion. They should be kept dry and not taken into the cockpit. Charts covered with a plastic laminate last much longer. A soft pencil (B2) must be used for plotting and a soft eraser, as this will avoid damaging the surface.

Navigational Instruments

The basic requirements are listed below:

1. Parallel rulers or square protractor
2. Dividers
3. Pencil compass
4. Notebook
5. 2B Pencils
6. Soft eraser
7. Charts
8. Steering Compass
9. Hand bearing compass
10. Speed or Distance Indicator
11. Depth Sounder



M**RADIO AND RADAR
RADIO EN RADAR****N****FOG SIGNALS
MISSEINE****O****DANGERS
GEVARE**

M		
4		RC Non-directional or circular radio beacon Ongerigte of alomgerigte radiobaken
9		Landmarks for visual fixing only Walmerke vir sigbepaling alleen
	◉	Radio Mast Radiomas
	◉	Radio Tr Radiotoring
	◉	Radar Sc Radar Scanner Radarastaster
10a		R Coast Radio Station providing QTG service Kusradiostasie voorsien QTG diens
12		Racon Radar responder beacon Radarantwoordbaken
13		Radar reflector Radarkaatsers
14	Ra(conspic)	Radar conspicuous object Opvallende radarvoorwerp
16		Aero RC Aeronautical radio beacon Lugvaartradiobaken
N		
1	◉	Fog signal station Misseinstasie
3	Explos	Explosive fog signal Knalmissiein
9	Dia	Diaphone Diafoon
13	Horn	Horn Mishoring
14	Bell	Fog Bell Misklok
15	Whis	Whistle Fluit
16	Reed	Reed Horn Tongfluit

1		(2) Whale Rk (3)	Above-water rock which does not cover.	Bowater rots wat ontbloom bly.
2		1,2 Dr 1mQ	Drying rocks which cover and uncover (with height above datum of soundings).	Droënde rotse wat bedek en ontbloom word (met hoogte bo lodingnulpak).
3		#	Rock awash at level of chart datum.	Rots oorspoel op vlak van kaartnulpak.
4			Submerged rock or ledge in 2 metres or less water at chart datum or rock at unknown depth.	Onderwaterrots of -lys in water van 2 meter of minder by kaartnulpak of rots op onbekende diepte.
5		19 R	Shoal sounding on isolated rock.	Vlak loding op afgesonderde rots.
6a		9	Depth at chart datum to which an obstruction has been swept by wire drag.	Diepte op kaartnulpak tot waar 'n versperring met 'n draadreg gegee is.
8a		SMt	Seamount.	Onderseese berg.
11		Wk	Wreck showing any portion of hull at level of chart datum.	Wrak waarvan enige deel van die romp op vlak van kaartnulpak uitsteek.
12		Masts and Funnel (Mast 2m) (Funnel)	Wreck of which masts and funnel are visible.	Wrak waarvan die maste en skoorsteen sigbaar is.
14		Wk	Wreck thought to be in 30 metres or less water and which is considered dangerous to surface navigation.	Wrak vermoedelik in water van 30 meter of minder en wat vir oppervlaknavigasie as gevaarlik beskou word.
15		Wk	Wreck over which the exact depth of water is known.	Wrak waaroor die presiese waterdiepte bekend is.
15a		12.5 Wk	Wreck with depth cleared by wire drag.	Wrak met diepte deur 'n draadreg gegee.
16		++	Wreck over which exact depth unknown but thought to be more than 30 metres; if less, not dangerous to surface vessels capable of navigating in area.	Wrak waaroor presiese diepte onbekend, maar vermoedelik meer as 30 meter; indien minder, nie gevaarlik vir oppervlakvaartuie wat in omgewing kan navigeer nie.
17		Foul	Foul ground.	Slegte bodem.

DEFINITIONS - Parallels of Latitude and Meridians of Longitude

Fig. 1

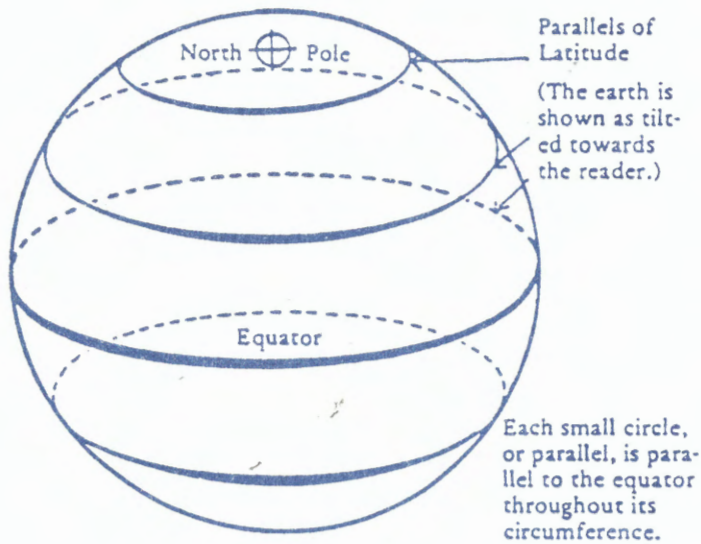


Fig. 2

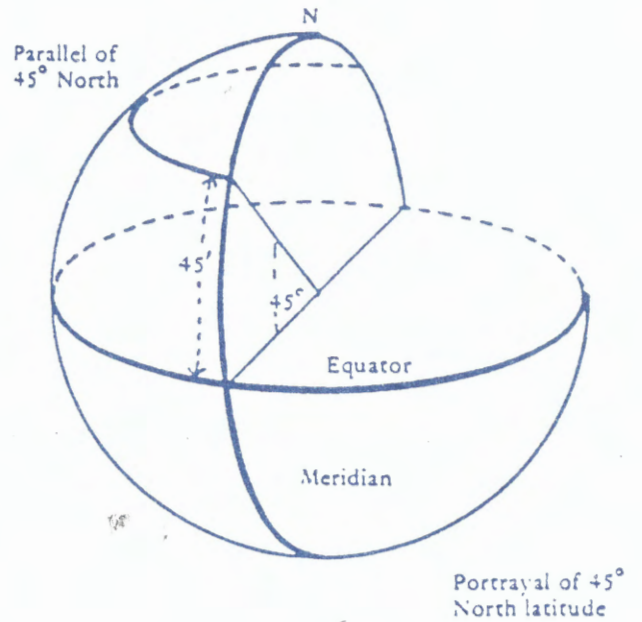


Fig. 3

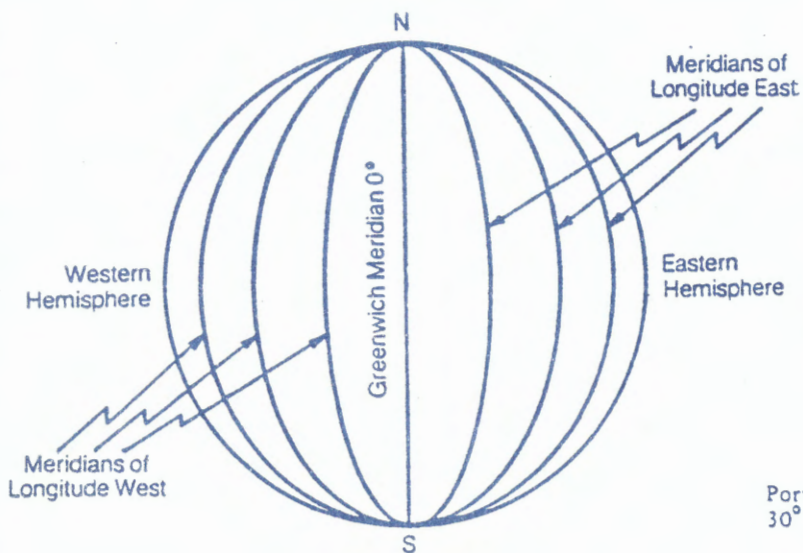
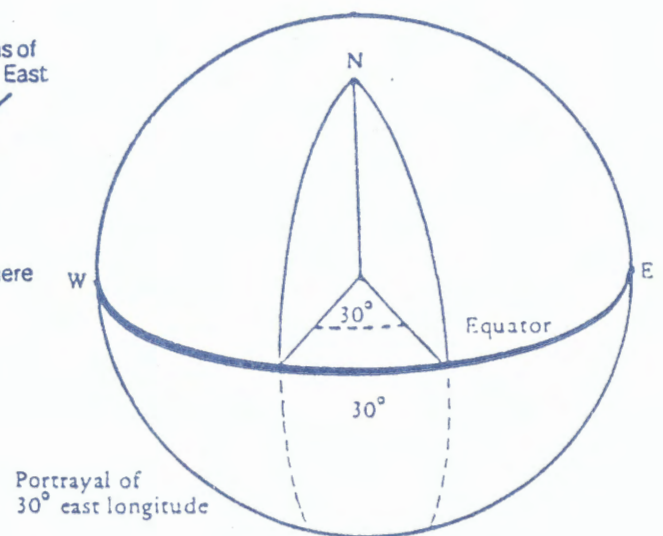


Fig. 4



Latitude

Lines of latitude (parallels) are drawn parallel to the equator by measuring from the centre of the earth in degrees, using the equator as 0°. Lines of latitude run from 0° to 90° South, and 0° to 90° North i.e. increasing towards the poles. (See Fig. 1 and 2)

Longitude

Lines of longitude (meridians) are drawn from the North to South Poles by measuring angles from the centre of the earth along the equator and using the Greenwich meridian 0° as the starting point. Lines of longitude run 0° to 180° East and 0° to 180° West. (See Fig. 3 and 4) They divide the earth in segments similar to an orange.

THE MERCATOR PROJECTION CHART

This type of chart has been used since the sixteenth century. It is constructed by projecting lines from the centre of the earth through the surface and onto a cylinder touching the earth along the equator. The cylinder is then opened out and reveals a representation of the earth on a flat surface.

The chart will have the following properties :

1. The equator appears as a straight line.
2. Parallels of latitude are straight lines equidistant from the equator.
3. Meridians of longitude are straight lines crossing the parallels at right angles.
4. A straight line crosses each meridian at the same angle.

At the equator there is little distortion, but as the meridians are projected as straight lines distortion increases north and south of the equator. To counteract the distortion the parallels are moved further apart which make land masses appear the correct proportional shape, but increases their area. Close to the poles the distortion is extreme and this projection cannot be used. Due to the compensation in latitude, distance along the latitude scale is correct but must always be measured level with the area of interest and never along the longitude scale.

One minute of arc along the latitude scale is called a nautical mile. (6076 feet, 1852 metres). A measurement of one nautical mile per hour, called a knot, refers to speed at sea.

USE OF THE MERCATOR PROJECTION CHART

Variation

On the mercator projection chart all the lines of longitude point towards TRUE NORTH, however, we use the magnetic compass for navigation and the compass points towards MAGNETIC NORTH. This is caused by the earth's magnetic field, which is continually changing.

Fig. 1

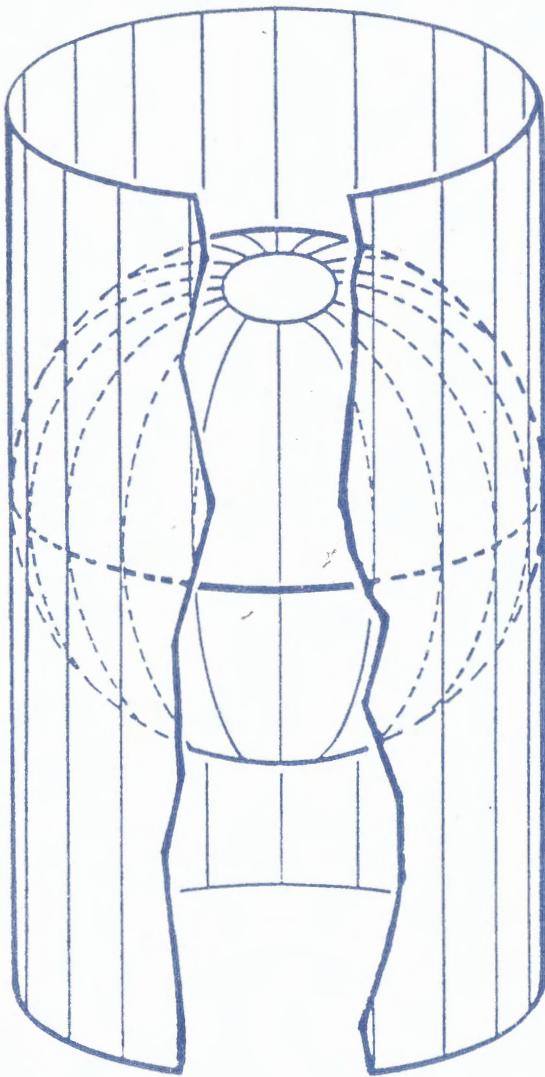
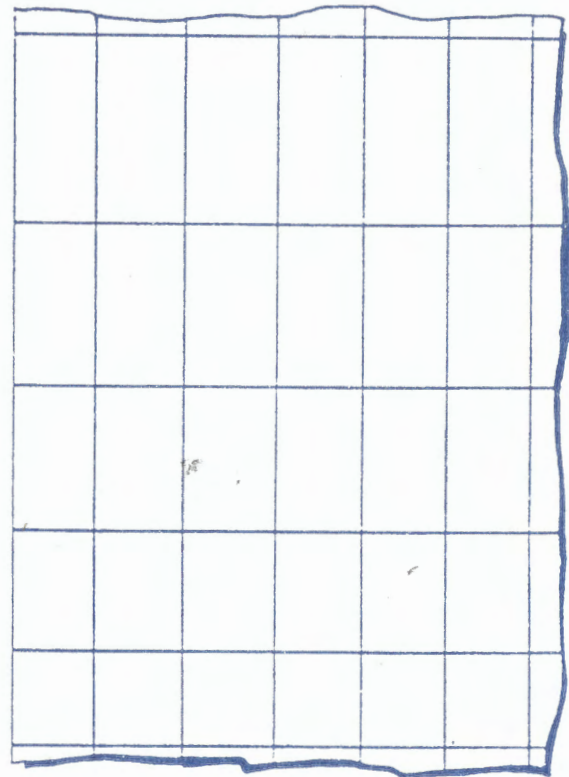
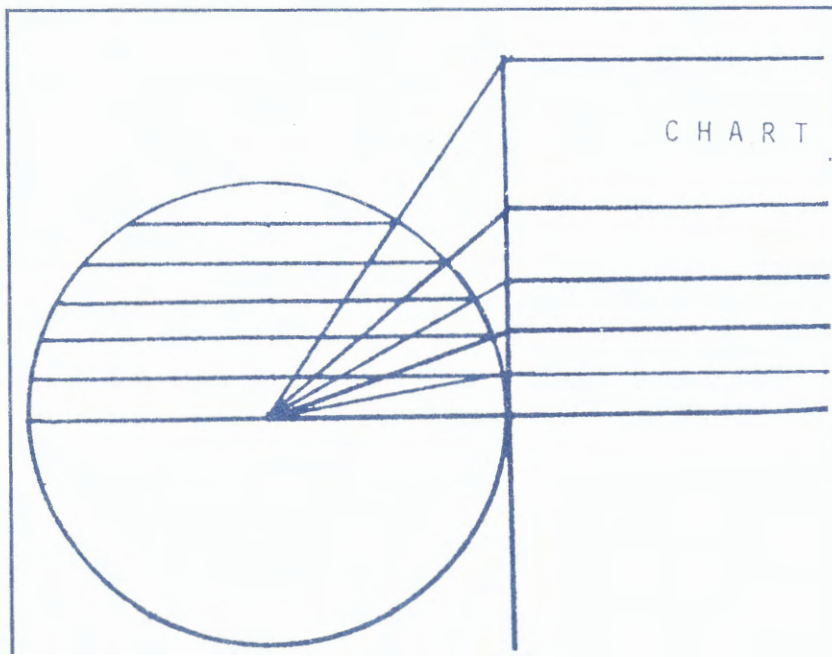


Fig. 2



MERCATOR PROJECTION:



THE MAGNETIC COMPASS

1. The small boat magnetic compass is made up of small magnets attached to a card which is graduated in degrees up from 0° to 360°.
2. The card is immersed in liquid and pivots on a jewel to rotate freely.
3. The whole compass is gimbaled to allow the card to remain horizontal as the boat rolls.
4. There are wires attached and aligned with the fore and aft line of the boat. These wires are called the lubber line, and the boat's heading is read from here.

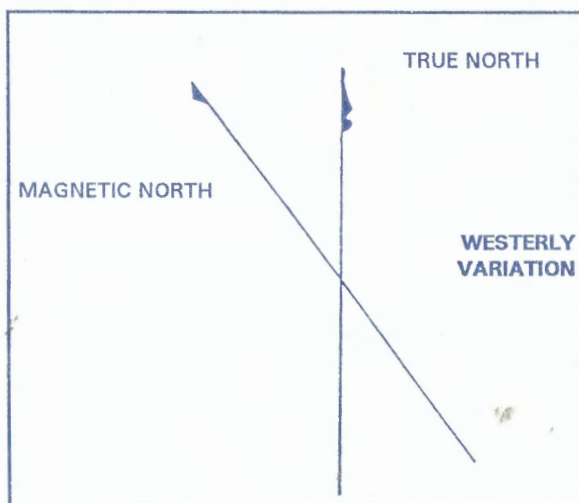
DEVIATION / VARIATION

1. A magnetic compass always points to MAGNETIC NORTH, which we know is different to True North, the angular difference being the VARIATION.
2. When the magnetic compass is mounted into the boat it is affected by the boats own magnetic field caused by the iron and steel aboard her. The compass error created by the boat's magnetic field is called DEVIATION and it varies according to the heading of the boat.
3. The compass can be adjusted so that the error is less than a few degrees on any heading. It must be done by a professional compass adjuster at least every two years or whenever a new metal part has been installed on the boat. Small corrector magnets are attached to the compass and when the compass adjuster "swings" the compass he will note the remaining deviation on each heading on a DEVIATION CARD.

A hand-bearing compass has no calculable deviation as it is not a permanent fixture and is moved about the boat.

The angular difference between True North and Magnetic North is called **VARIATION**. Variation differs in various parts of the world and alters slowly over the years. Every chart will tell you the variation for the area and also the annual change. The variation is found on the compass rose.

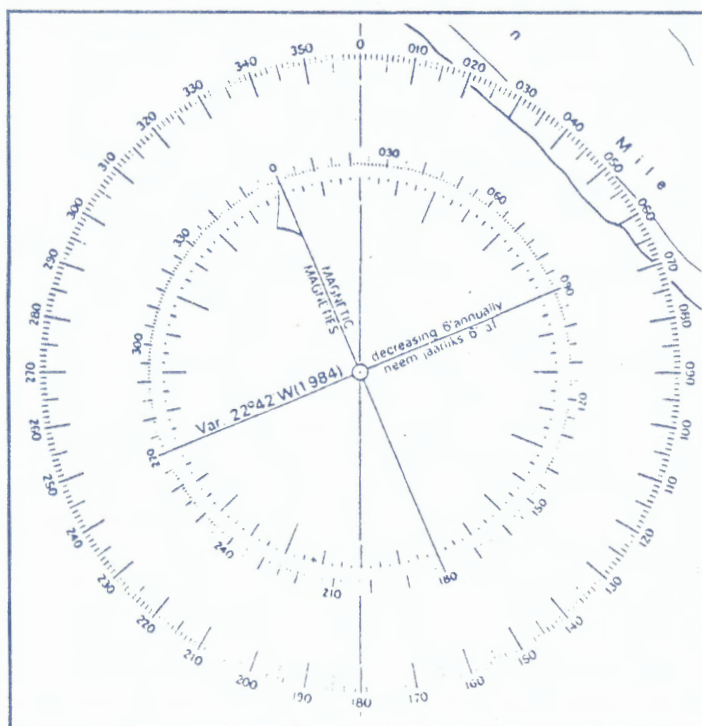
THE MAGNETIC COMPASS - VARIATION



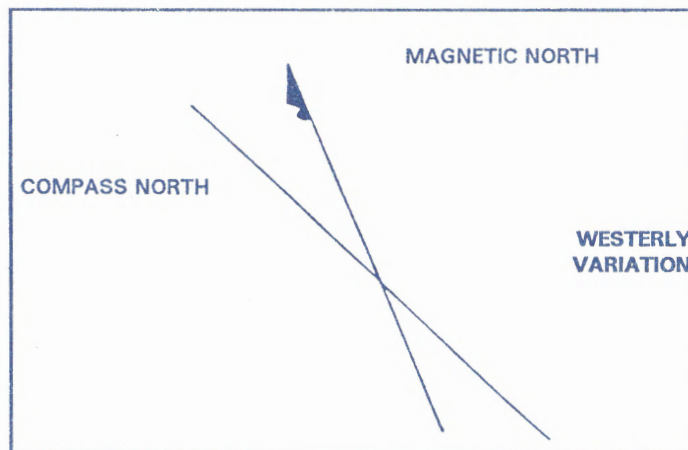
THE COMPASS ROSE

Since navigation involves the use of a compass, a reproduction of the compass card called the compass rose is printed at strategic points across the chart to make navigation easy. The compass rose is graduated from 0° to 360° and the details of the variation is printed in the centre circle. As the variation changes annually the inner circle can only be used for the year of map publication. Thereafter the variation must be calculated and the outer rose used.

Variation as shown on a chart



THE MAGNETIC COMPASS - DEVIATION



PRINCIPLES ON WHICH THE MERCATOR CHART IS BASED

Meridians displayed on chart as vertical parallel lines. To overcome this distortion each degree of Latitude is progressively increased from the Equator (Fig. 2)

REMEMBER: 6 (six) feet = 1 (one) fathom

Latitude Scale is place where you measure distances on chart

1 minute of latitude = 1 nautical mile = 6 080 feet approximately

1/10 of a minute = 1 cable = 200 yards approximately

When taking measurements on the chart, use scale OPPOSITE to where you are working.

COMPASS ERRORApplying Variation and Deviation:

Everything drawn on the chart relates to True North and the compass relates to Magnetic or Compass North. It follows that in order to relate a course plotted on the chart to a compass course, the error has to be calculated. This error is called COMPASS ERROR. The following method is easy and foolproof!

Step 1.

Draw and head 5 columns.

TRUE	VARIATION	MAGNETIC	DEVIATION	COMPASS
------	-----------	----------	-----------	---------

(Timid

Virgins

Make

Dull

Company)

A cheerful phrase to help you remember the headings !!!

Step 2.

If you are working from True to Compass remember the rhyme:

ERROR WEST - COMPASS BEST (ADD)

ERROR EAST - COMPASS LEAST (SUBTRACT)

(i.e. If the variation is west - add it and if it is east - subtract it)

Step 3.

If you are working from Compass to True (i.e. backwards) then reverse the above.

EXAMPLE 1 :

True course on the chart is 270° (T)

Variation (from compass rose) 10° W

Deviation (from deviation card) 3° E

What compass course would you steer?

W +
E -

W -
E +

T	V	M	D	C
270	010W	280	003E	277

277° (c) is the compass course to steer.

EXAMPLE 2 :

Your compass course is 190° (c)
 Variation 20° W
 Deviation 1° E
 What course would you plot on the chart?

W +
E -

W -
E +

T	V	M	D	C
171	020W	191	001E	190

171° (T) is the course to plot

EXERCISE 1

Fill in the gaps.
 Variation is 20° W.
 Deviation - from Deviation card below.

TRUE	VARIATION	MAGNETIC	DEVIATION	COMPASS
154				
				240
350				
				065
190				
				005

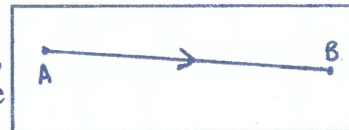
Compass Deviation Card

0	N	0°	180	S	1°W
10		0°	190		2°W
20		1°E	200		2°W
30		1°E	210		2°W
40		1°E	220		3°W
50	NE	2°E	230	SW	3°W
60		2°E	240		2°W
70		2°E	250		2°W
80		2°E	260		1°W
90	E	1°E	270	W	1°W
100		1°E	280		1°W
110		1°E	290		1°W
120		0°	300		1°W
130		0°	310		0°
140	SE	0°	320	NW	0°
150		0°	330		0°
160		1°W	340		0°
170			350		

DIRECTION

To determine what compass course to steer between two points (usually the boat's position and destination), the navigator first has to lay off the course on the chart.

1. Mark the boat's position and the destination on the chart, join them with a straight line and mark the line with one arrow (the symbol for course to steer).



2. Lay the parallel rulers on the line and run the rulers to the nearest compass rose. Where the ruler runs through the centre of the rose and cuts the outer ring in the direction in which the boat is to travel, read off the degrees. This is the True course to steer.
3. Apply the compass error as described earlier and the result is the compass course to steer.

THREE POINT FIX

Observation of a landmark with a hand bearing compass is called a bearing and when plotted on the chart gives you a position line. Your boat's position is somewhere along this line. A second bearing will give you a second position line which will intersect the first. A common error is to think that you are where the bearing intersects.

Remember : - ***YOU NEVER ARE WHERE YOU THINK YOU ARE !!***

Inaccuracies creep in because :

1. The boat is travelling forward.
2. The boat is rolling about.
3. Inaccuracies in the compass
4. Unsteady hand holding the compass
5. Graduations on compass close together so you may read bearing a degree or two out.

To offset these inaccuracies three bearings are taken.

The three position lines will not intersect at one point but make a triangle known as a cocked hat. The size of the cocked hat will give you a check on the accuracy of the position lines. A small cocked hat will give you a FIX. Place yourself at the corner closest to danger.

NB: The objects observed should be far apart.
70° to 90° works well.

Worked Example

Sailing off Durban, 3 bearings were taken.

1. Signal Tower 296° (M)
2. Cooper Light 273° (M)
3. Water Tower 338° (M)

Using Variation 20°W and Deviation as 0° (because we used a hand bearing compass)

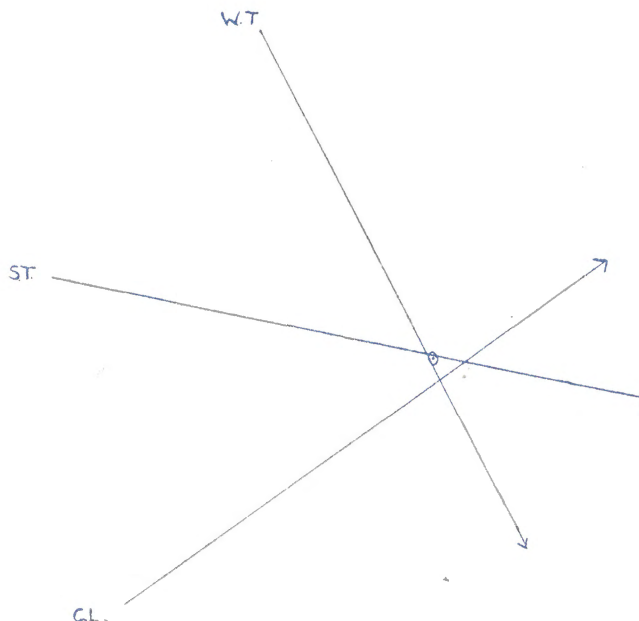
W +

W -

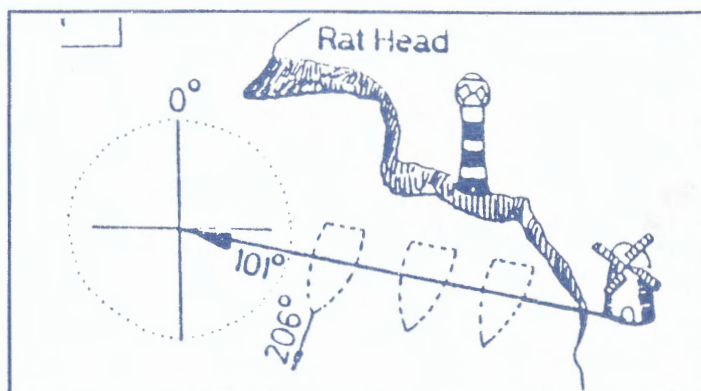
E - →

← E +

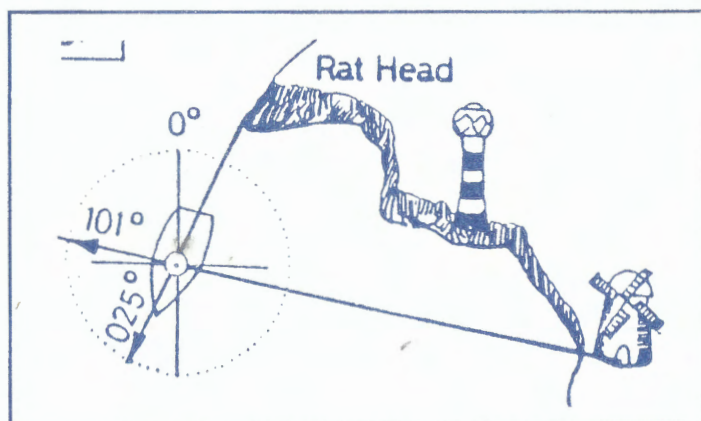
T	V	M	D	C
276	020 W	296	0	296
253	020 W	273	0	273
318	020 W	338	0	338



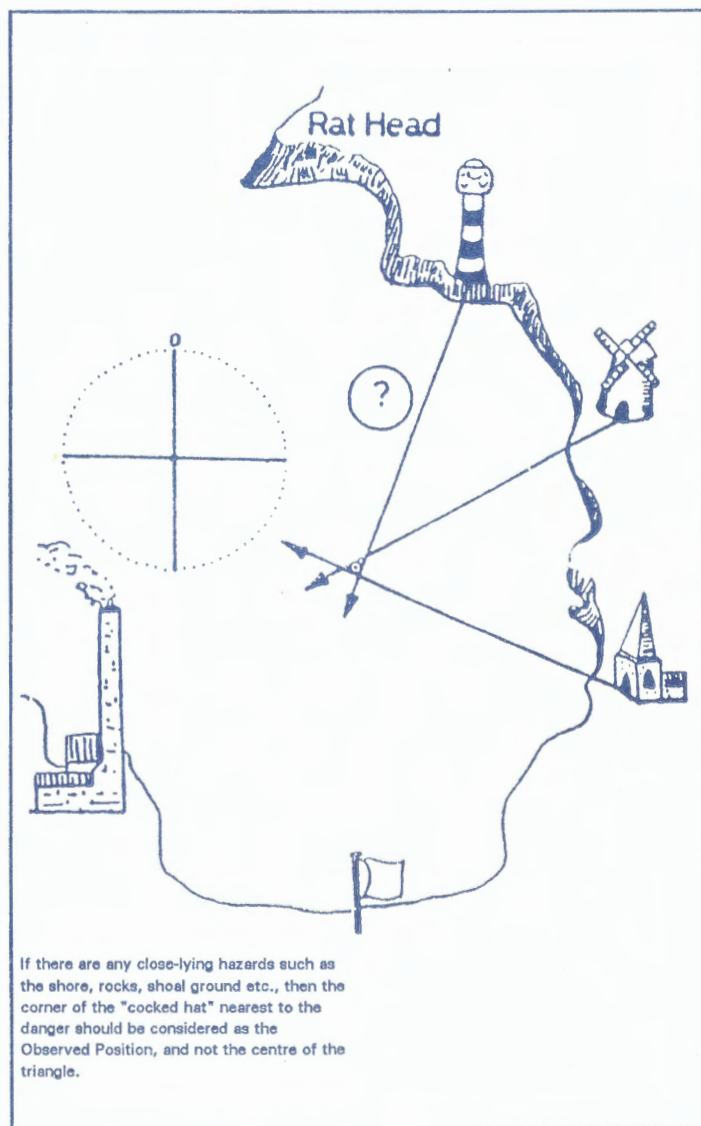
One position line



Two position lines gives a fix.



Three position lines gives a "cocked hat".



SKIPPERS

GENERAL DEFINITIONS

- a. The word "vessel" includes every description of water craft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water.
- b. The term "power-driven vessel" means any vessel propelled by machinery.
- c. The term "sailing vessel" means any vessel under sail provided that propelling machinery is not being used.
- d. The term "vessel engaged in fishing" means any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability.
- e. The word "seaplane" includes any aircraft designed to manoeuvre on the water.
- f. The term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.
- g. The term "vessel restricted in her ability to manoeuvre" means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel. The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to:
 - i. a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;
 - ii. a vessel engaged in dredging, surveying or underwater operations;
 - iii. a vessel engaged in replenishment or transferring persons, provisions or cargo while under way;
 - iv. a vessel engaged in the launching or recovery of aircraft;
 - v. a vessel engaged in mineclearance operations;
 - vi. a vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.
- h. The term "vessel constrained by her draught" means a power-driven vessel which because of her draught in relation to the available depth of water is severely restricted in her ability to deviate from the course she is following.
- i. The word "underway" means that a vessel is not at anchor, or made fast to the shore, or aground.
- j. The words "length" and "breadth" of a vessel mean her length overall and greatest breadth.
- k. Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.
- l. The term "restricted visibility" means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.

HARBOUR REGULATIONS

1. Craft to be seaworthy.
2. Craft to be registered (current year).
3. Competent qualified skipper on board.
4. Competent crew on board.
5. Skipper and adequate crew to be sober!
6. Max speed 8 knots.
7. Abide by "Rules for Prevention of Collisions at Sea" - BUT no pleasure craft has right of way over official or commercial craft in a harbour.
8. Restricted area - NE corner of No. 1 Pier to S end of coaling terminal at Bluff, **DO NOT CROSS TO S OF THAT LINE.**
9. When holding off to exit harbour, wait in vicinity to B Shed.
10. Do not come within 30 metres of any ship docked in the harbour.
11. No pleasure craft to be outside harbour at night unless on a journey (flight plan approved by P.C.) or on an approved training exercise in boat/with skipper who are authorized.
12. No anchoring in a channel or in navigable part of harbour.
13. No swimming in harbour.

DURBAN LIST OF HARBOUR SIGNALS, LIGHTS, SHAPES, BUOYS, ETC.

NORTH PIER	Isophase
SOUTH BREAKWATER	Flashing White TWO every FIVE seconds
STARBOARD HAND CAISSONS	One Flashing Green on each caisson
POWER HAND CAISSONS	One Flashing Red on each caisson
BUOY OFF OLD REPAIR QUAY	Flashing White light
BUOY OFF EAST CORNER	

SALISBURY ISLAND	Flashing Green light
LEADING LIGHTS IN TRANSIT	215°70' 035°30'
FRONT LOWER LEADING LIGHT	ISO Red 2 sec
BACK UPPER LEADING LIGHT	OCC White 4 sec

EAST CORNER OF "T" JETTY	Flashing Green light
WEST CORNER OF "T" JETTY	Flashing White light
EAST CORNER OF PIER 1	Flashing Red light
WEST CORNER OF PIER 1	Flashing White light

PORT HAND ESPLANADE CHANNEL	Red Flashing lights
STARBOARD HAND CONICAL BUOYS	Green Flashing lights
EAST CORNER OF PIER 2	Flashing Red light
CLOSE TO N.E. BUOYS AT No. 1 MOORING	Quick Flashing White light
GALE WARNING	Red light on Terminal Building

Vessel entering Durban Harbour	
Day and Night	Green - all round vector

Vessel leaving Durban Harbour	Red - all round vector
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Entrance closed	Flashing Red all round vector
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ALTERNATE: Flag "H"	- Vessel leaving harbour
Flag "I"	- Vessel entering harbour
Flag "P"	- Indicates channel is blocked

Bar signals hoisted at Signal Station

Cone pointed upward, hoisted right up - bar is impassable
 Cone pointed upward, hoisted halfway - bar is dangerous

Dredgers will show two balls hoisted vertically on side which is dangerous to pass. DO NOT PASS on this side.

Two diamonds hoisted vertically on side which is safe to pass.

Vessel restricted in ability to manoeuvre 3 shapes in vertical line highest and lowest to be balls and middle to be diamond.

Light Characters

For an explanation of lights on IALA System A see L70

Fathoms and Metric Charts

CLASS OF LIGHT		International abbreviations	Older form (where different)	Illustration Period shown		
21	Fixed (steady light)	F				
22	Occulting (total duration of light more than dark)					
22	Single-occulting	Oc	Occ			
27	Group-occulting e.g.	Oc(2)	Gp Occ(2)			
(Ka)	Composite group-occulting e.g.	Oc(2+3)	Gp Occ(2+3)			
23a	Isophase (light and dark equal)	Iso				
23	Flashing (total duration of light less than dark)					
23	Single-flashing	Fl				
(Kb)	Long-flashing (flash 2s or longer)	L Fl				
28	Group-flashing e.g.	Fl(3)	Gp Fl(3)			
(Kc)	Composite group-flashing e.g.	Fl(2+1)	Gp Fl(2+1)			
24	Quick (50 to 79—usually either 50 or 60—flashes per minute)					
24	Continuous quick	Q	Qk Fl			
(Kd)	Group quick e.g.	Q(3)	Qk Fl(3)			
25	Interrupted quick	IQ	Int Qk Fl			
(Ke)	Very Quick (80 to 159—usually either 100 or 120—flashes per minute)					
(Ke)	Continuous very quick	VQ	VQk Fl			
(Kf)	Group very quick e.g.	VQ(3)	VQk Fl(3)			
(Kg)	Interrupted very quick	IVQ	Int VQk Fl			
(Kh)	Ultra Quick (160 or more—usually 240 to 300—flashes per minute)					
(Kh)	Continuous ultra quick	UQ				
(Ki)	Interrupted ultra quick	IUQ				
30a	Morse Code e.g.	Mo(K)				
29	Fixed and Flashing	FFl				
26	Alternating e.g.	AlWR	AltWR			
COLOUR		International abbreviations	Older form (where different)	RANGE in sea miles	International abbreviations	Older form
67	White	W (may be omitted) i.e. when		Single range e.g.	15M	
66	Red	R	no colour is given assume it to be white	2 ranges e.g.	14/12M	14,12M
64	Green	G		3 or more ranges e.g.	22-18M	22,20,18M
(Kj)	Yellow	Y				
65	Orange	Y	Or			
63	Blue	Bu	Bl			
61	Violet	Vi				
ELEVATION is given in metres (m) or feet (ft)				PERIOD in seconds e.g.	5s	5sec

TYPES OF LIGHTS

- Fixed (F) : A continues steady light.
- Flashing (F1) : Showing one or more flashes at regular intervals, the duration of light always being less than that of darkness.
- Quick Flashing (QK.F1) : Flashing continuously more than 60 times a minute.
- Group Flashing (Gp. F1) : At regular intervals 2 or more flashes in a group.
- Occulting (Occ.) : A steady light with at regular intervals a sudden total eclipse. the duration of darkness being less than the duration of light.
- Alternating (Alt.) : A light which alters in colour when seen from any one place, not be confused with a light which has coloured sectors.
- Isophase : Light and darkness equal in time.

DAYMARKS FOR VESSELS

These signs are shown by day in all weathers on vessels to denote certain activities in which they are engaged. In restricted visibility the appropriate lights may also be displayed by day.

Vessel at Anchor

Forward, where best seen



one BLACK BALL

Vessel Under Power with Sails Set (Motorsailing)

Forward, where best seen

One BLACK CONE,
point down

Power-Driven Vessel Towing

Vessel being towed if length of tow exceeds 200m

Each vessel
where best seen

One BLACK DIAMOND



Length of Tow measured here

Vessel Aground

Where best seen



THREE BLACK BALLS
(Not required for ships under 12m length, provided they are not in a narrow channel, fairway or anchorage, or where other vessels normally navigate.)

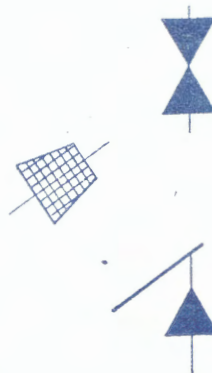
This signal does
not indicate distress
or need for help.

DAYMARKS FOR VESSELS

Vessels Fishing - Trawls, Nets, or other Gear
(Underway or at Anchor)

TWO BLACK CONES
Points inward.

OR if ship under 20m
length, she may instead
show a BASKET



If outlying gear extends
over 150m horizontally from
ship, she also shows BLACK CONE,
point up, in direction of gear.

Vessel Not Under Command

NOT Distress, but indicates
inability to manoeuvre

TWO
BLACK
BALLS

Vessel Constrained by Her Draught - (Power-driven vessel restricted to narrow channel by her draught and thus unable to deviate from course).

Where best seen



ONE CYLINDER

DAYMARKS FOR VESSELS

Vessel Restricted in Ability to Manoeuvre

(e.g. ships engaged in Flying Aircraft - Cable Laying - Replenishment at Sea - Underwater Operations - Servicing Navigation Marks - Towing, where manoeuvre is restricted by tow).

This signal does NOT
indicate distress or
a need for help

(When at anchor, ship
also shows anchor shape.)



BLACK BILL

BLACK
DIAMOND

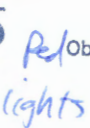
BLACK BALL

Vessels engaged in Underwater Operations or Dredging, with an obstruction on one side shall in addition to the above Shapes, carry TWO BLACK BALLS on the side of the obstruction, and TWO BLACK DIAMONDS on the side on which vessels may pass.

Pass safely
this side



Obstruction
this side



Diving Operations from Vessel (Too small to show shapes described above).

Best placed for
all round vix.



A rigid replica
of code flag "A"
at least 1 metre high.

Vessel Minesweeping

Dangerous to approach closer
than 100m astern or 500m on
either side.

THREE
BLACK
BALLS

EXERCISE 2

BUOYAGE SYSTEM "A"

LATERAL MARKS

Used in Conventional Direction of Buoyage to show limits of navigable channels in general direction of approach into harbour or clockwise around continental land masses. Thus Conventional Direction in British Isles is clockwise round Europe from SW to NE

PORT HAND

STARBOARD HAND



(In exceptional cases, BLACK may replace GREEN)

Topmark - RED CAN

Topmark - GREEN CONE

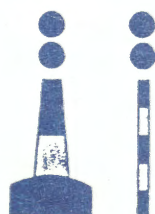
Lights - Red - any rhythm

Lights - GREEN - any rhythm

Numbered/Lettered Marks - if used, follow the Conventional Direction of Buoyage.

ISOLATED DANGER MARKS

A mark erected on, or moored on or above an isolated danger, which has navigable water all round it.



Beacon, Pillar buoy or Spar buoy coloured BLACK with one or more horizontal RED bands.

Topmark - TWO BLACK SPHERES (VERTICAL)

Lights - WHITE - Group Flashing (2)



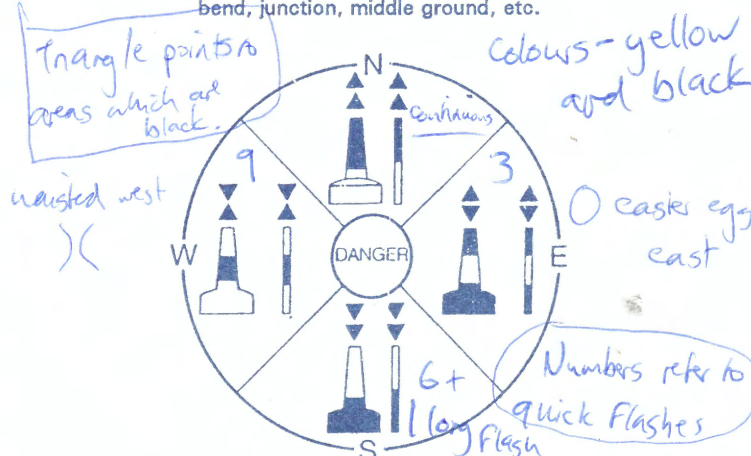
BUOYAGE

CARDINAL MARKS

Cover the four quadrants N - E - S - W. A cardinal mark is named after the quadrant in which it is placed. This indicates that it should be passed on that side e.g. pass to south of South Mark for safe passage. See diagram below.

Examples of use:

- To indicate location of best navigable water.
- To indicate safe side on which to pass danger, e.g. shoal, rocks, wreck.
- To draw attention to feature in a channel, e.g. bend, junction, middle ground, etc.



NOTES: BLACK/YELLOW colour combination relates to position of points on double top mark (e.g. W - points together = yellow/BLACK/yellow).

LIGHT CHARACTERISTICS indicate quadrant by relating to clock face (e.g. group of 3 flashes = 3 o'clock East. 9 flashes = 9 o'clock West)

LIGHTS when fitted are WHITE for all quadrants.

NORTH - VQ or Q

EAST - VQ (3) ev. 5 sec. or Q (3) ev. 10 sec.

SOUTH - VQ (6) + L. Fl. ev. 10 sec. or Q (6) + L. Fl. ev. 15 sec.

WEST - VQ (9) ev. 10 sec. or Q (9) ev. 15 sec.

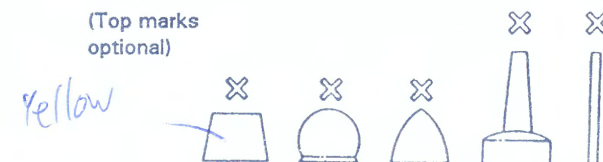
BUOYAGE

A NEW DANGER not yet shown on charts will be indicated by the duplication of at least one of the marks warning of its presence. The duplicate may carry a racon, coded D (- • •). If Cardinal mark lights must be white Quick Light or Very Quick Light.

SPECIAL MARKS

Show special features e.g. Traffic Separation Schemes, Recreation zones, Military zones and Spoil grounds. May also be used to define a channel within a channel for the use of deep-draft vessels. Boundary buoys of appropriate Lateral shape, or yellow spherical buoys down centreline. (Relevant details must be sought on chart or in pilot.)

(Top marks optional)

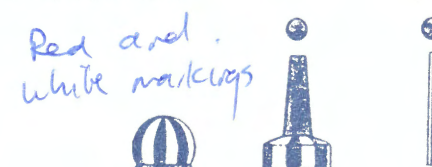


SHAPE - Not to conflict with Nav. Marks, but if can or cone treat as lateral mark.

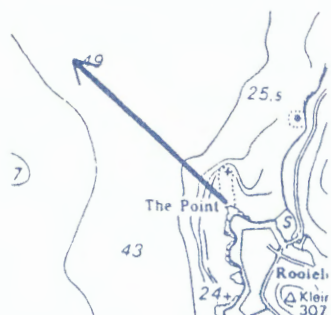
LIGHTS - YELLOW - Any rhythm other than those used for Cardinal, Isolated Danger or Safe Water Marks.

SAFE WATER MARKS

Show navigable water all round e.g. mid-channel marks, or indicate a landfall.



LIGHTS - WHITE - Isophase, Occulting, or one Long Flash (2 secs. approx.) every 10 seconds, or Morse "A".

B: COASTAL NAVIGATIONLOCAL WATER SKIPPER ONLYNAVIGATIONSYMBOLS USED IN CHARTWORK

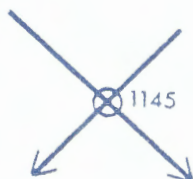
A bearing or position line is given a single arrow, pointing away from the object from which the bearing was taken.



A range circle, actually an arc of a circle with its centre on a fixed mark.



A transferred position line.



When an absolutely certain position, generally called a fix, has been obtained it is ringed and the time and log reading marked on the chart.

Always write the time and the log reading on the chart

- Whenever a fix has been obtained.
- When a single bearing is obtained, if it makes sense to do so.
- Whenever course is altered.
- Whenever an EP is recorded on the chart.
- When a DR position is projected on its own, but not if it forms a part of a projection to obtain an EP.

NAVIGATION

SYMBOLS USED IN CHARTWORK



The course to be steered, or the course steered.

- also known as water track

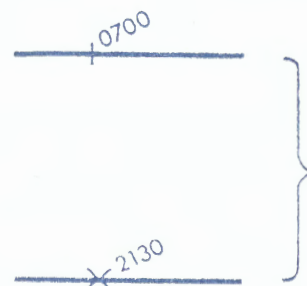


The course to "make good", or the course made good.

- also known as ground track



A line indicating the direction and rate of a tidal stream, commonly called a tidal vector, is given three arrow flights pointing in the direction in which the stream flows.



A dead reckoning (DR) position is indicated by a cross, or by a short line across the course line. The time at which the position was determined is written alongside.

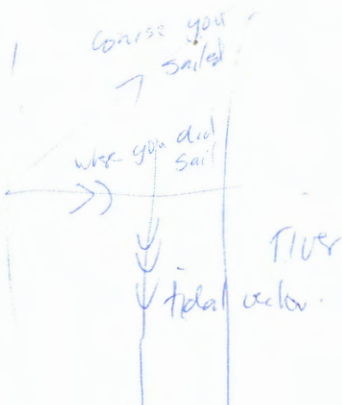


An estimated position (EP) is indicated thus, again with the time.



Fix

in large radiating

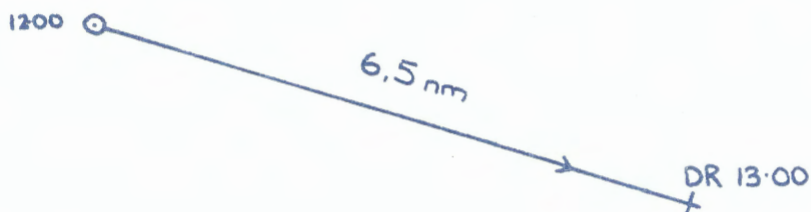


POSITION

Dead Reckoning Position (DR)

If it is not possible to take a fix, the boat's approximate position can be calculated from the course steered and distance travelled from the last fix.

EXAMPLE



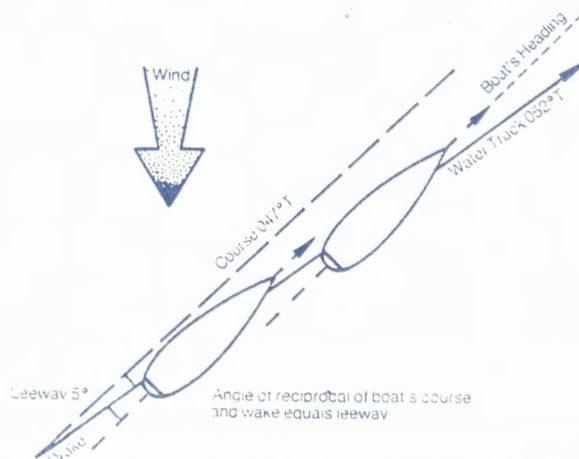
Estimated Position (EP)

If you apply leeway, set and drift of any current to DR position, the position obtained is called an estimated position.



Leeway

Leeway is the sideways movement of the boat caused by the wind. The angle of leeway differs with the course relative to the wind. If the boat is closehaunched the leeway is maximum. Boatspeed and windstrength also affect leeway. An estimate of leeway can be calculated by taking a bearing of the boat's wake and subtracting the reciprocal of the boat's heading. Leeway is always applied away from the wind as the boat will have been blown sideways downwind.



EXERCISE 1

SHIPS HEAD (COMPASS)	DEVIATION	SHIPS HEAD (COMPASS)	DEVIATION
000	7 E	180	7 W
022 ½	4 E	202 ½	6 W
045	2 E	226	6 W
067 ½	0	247 ½	2 W
090	1 W	270	1 E
112 ½	3 W	292 ½	3 E
135	6 W	316	5 E
157 ½	7 W	337 ½	8 E

Use the standard deviation table except where stated otherwise

1. A yacht is steering a course of 230° C.
Variation is 7° W
What is the true course?

W+
E-
T U M D C
~~230~~ 7° ~~230~~ 230
217 224° W

NB!
W+
E-
W-
E+

2. What magnetic course should be steered to give a true course of 072° (T) if variation 9° E?

T U M D C
 072.9 063.0 063

~~072~~ 063°

3. The following magnetic bearings are taken with a hand bearing compass:

Lighthouse 310° (M) -302°
Headland 023° (M) -015°
Water Tower 075° (M) -067°

The variation of 8° W. What are the true bearings to plot?

4. A yacht is steering a course of 135° (C).
Variation is 11° E.
What is her true course?

W+
E-
T U M D C
~~135~~ 11° 129.6 W 135
 140° E

5. What compass course should be steered to give a true course of 292° (T) if variation is 4° W?

T U M D C
 292.6 W 296 299 293

6. Steering directly towards 2 beacons in transit a yacht's heading is observed to be 145° (C).
The charted bearing of the transit is 153° (T). Variation is 7° W.
What is the deviation of the compass on this heading?

W+
E-
T U M D C
 153° 7° W 160 15° E 145°

EXERCISE 2YACHT SKIPPER INTRODUCTION TO COASTAL NAVIGATION

- Lat $29^{\circ} 31' 48''$ $31^{\circ} 5' 28''$ Long
- What is the latitude and longitude of Umhlanga Rocks Light? $29^{\circ} 31' 48''$
Fl - Flashing (3) - three small flashes 20s - every 20 seconds 25m - above sea level
 - What are the characteristics of Umhlanga Rocks Light? 24M - range of 24 miles
Fl(3) 20s 25m 24M EER. E FR - (Fixed Red)
 - What is the number of your chart? SAN 135
 - On what projection has it been constructed? Mercator see page 68
 - When was the chart published? 24 Sep 1982
 - What are the variations - now - on the NW and SE areas of the Chart?
 $20^{\circ} 5' W$ $20^{\circ} 42' W$
 - Plot the following position:
 $29^{\circ} 51' 8'' S$
 $31^{\circ} 03' 8'' E$
 $20^{\circ} 29' W$

EXERCISE 3

- Following bearings taken:
 - Mouth - Lovu River - $280^{\circ} M$
 - Cutting - Mlazi River canal - $016^{\circ} M$
 - Nyoni rocks - $317^{\circ} M$

Plot position.

- From this position give compass course to steer to a point 2 miles east of edge of shallowest point in ALiwal Shoal at edge of red vector of Green Point Lighthouse.
Deviation 5 E
Boat speed of 5 knots. Give the time it will take to reach this point.

nautical mile

TIME

=

DISTANCE
SPEED

1 knot = 1 M/hr

Always work in true on the chart

1 M = 1' of true longitude

TIDAL STREAMS

Tidal streams are the horizontal movement of water caused by the vertical rise and fall of the tide. Tidal streams reverse their direction every six hours or so and often run at about two knots or more.

Tidal streams (and currents) are described by the direction towards which they flow, i.e. a tidal stream setting of 180° is flowing from north to south.

Some coastlines have a simple ebb and flow of tide with a small rise and fall. The tidal streams in these areas are relatively insignificant. Estuaries and landlocked coastal waters are affected by strong tidal streams which make navigation difficult.

If the tidal stream is from ahead of astern only speed over the ground will be affected. If the tidal stream is cutting across the course, the boat will be set sideways at a rate dependent on the direction and speed of the stream.

When you are plotting an estimated position the set and drift (the direction distance covered) is found on the chart and is applied at the end of the water track.

THE VECTOR DIAGRAM

The tidal stream information is given in knots (nautical miles per hour) so it simplifies the calculation if you use a 1 hour period.

WORKING UP AN ESTIMATED POSITION

Always work in true

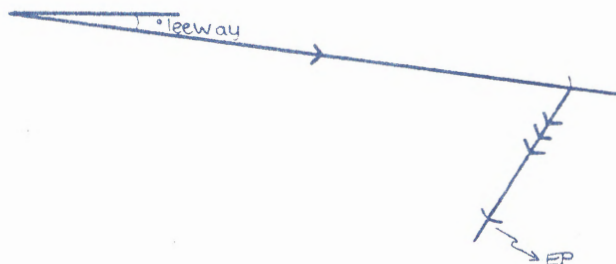
1. Draw in course line after leeway has been taken into account (this is your water track).



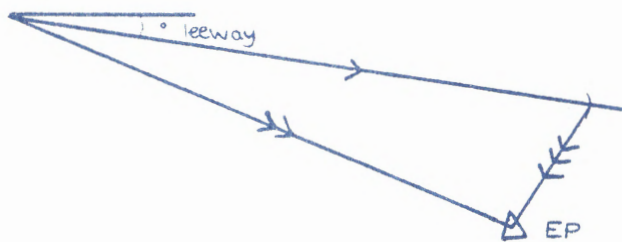
2. Arc off the distance covered in one hour along the course line.



3. From this position draw the current set and drift for a one hour period. This is your estimated position.



4. Join starting point to your estimated position. This line is your ground track.



Remember to recalculate your speed from the ~~st~~ course made good (ground track) as it has been altered by current

Wind is described as coming from

CURRENT AND LEEWAY (DRIFT)

EXERCISE 4

CHART SAN 135

Your position at 1200 is $30^{\circ}13' S$
 $30^{\circ}50'7 E$

Your course is 122 C (use deviation $5^{\circ} E$)

Leeway is 10°

Current 215° setting at 3 Kts.

Boat speed is 6 Kts.

Wind direction is S

State your estimated position at 1400

Show all chart working and ground track and state speed made good.

T V M D E C
107° 20' W 127° 5' E 122°

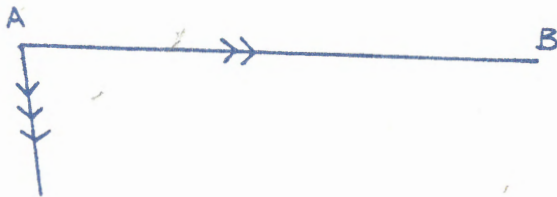
WORKING UP A COURSE TO STEER

1. Draw the ground track (your position towards your destination).



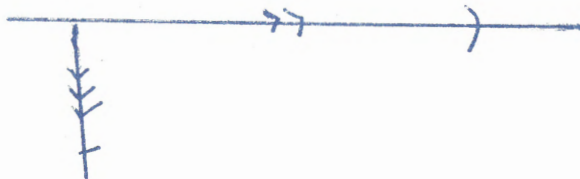
This is "course to make good".

2. Find the set and drift information on the chart. Draw a line from your starting position in the direction of the tide.

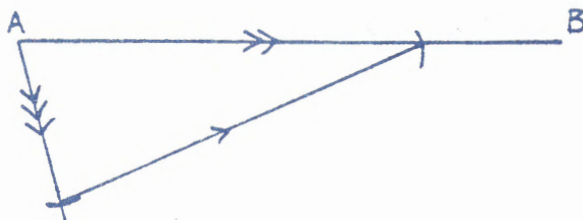


This is the tide line and points in the direction of flow.

3. Use dividers to measure the tidal stream in knots on the latitude scale. Put one point on the start position and arc the other point across the tide line.



4. Use the dividers to measure the number of miles your boat will travel in one hour. Put one point at the end of the tide line and arc the other point across the ground track. Draw in the line. This is the "course to steer".



5. Leeway is now taken into account.
Note: The boat stays on the ground track although it is pointing upstream.

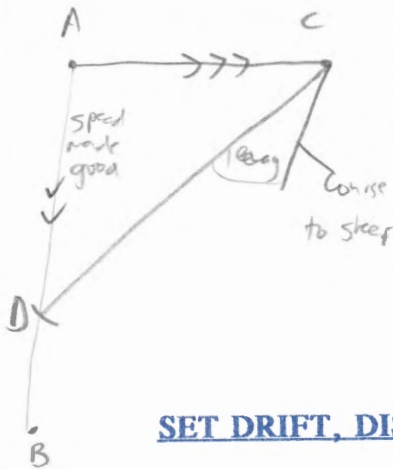
Always work in true!

EXERCISE 5

Compass Deviation Card

0	N	3°W	180	S	5°E
10		3°W	190		5°E
20		4°W	200		5°E
30		5°W	210		5°E
40		6°W	220		5°E
50	NE	6°W	230	SW	5°E
60		5°W	240		6°E
70		5°W	250		6°E
80		4°W	260		6°E
90	E	3°W	270	W	6°E
100		3°W	280		6°E
110		2°W	290		5°E
120		1°W	300		4°E
130		1°W	310		3°E
140	SE	1°W	320	NW	2°E
150		1°E	330		1°E
160		2°E	340		0°
170		3°E	350		2°E

- From A draw ground track 'B'
- From A draw current track to C
- From C measure boat speed on the ground track at 'D'
- From C adjust for leeway = course to steer
- AD = speed made good



$$237 - 8^\circ = 229^\circ$$

SET DRIFT, DISTANCE AND TIME CALCULATION

CHART SAN 135

Obtain a fix from the following:

BUILDING AT BALLITOVILLE
BEACON AT GENEZZANO

002° (M)
279° (M)

$$\begin{array}{r}
 T \quad V \quad M \quad D \quad C \\
 090^\circ 20' W \quad 110^\circ \\
 5^\circ 20' W \quad 74^\circ \\
 46^\circ 20' W \quad 66^\circ 50' W \quad 71^\circ \\
 226^\circ 20' \quad 246^\circ 5' E \quad 241^\circ \\
 229^\circ 20' W \quad 249^\circ 5' E \quad 244^\circ
 \end{array}$$

From this position at 10:00 give a course to steer (C) and an estimated time of arrival at the Durban Harbour Entrance given the following:

WIND
CURRENT
BOAT SPEED
LEEWAY

SE
090° (T) SETTING AT 3 KTS
6 KTS
8°

$$\begin{array}{l}
 \text{Time} = \frac{19.0 \text{ M}}{3.9 \text{ Knts}} \\
 \text{Distance}
 \end{array}$$

Course to steer: 244° (C)

Distance = 19.4 M

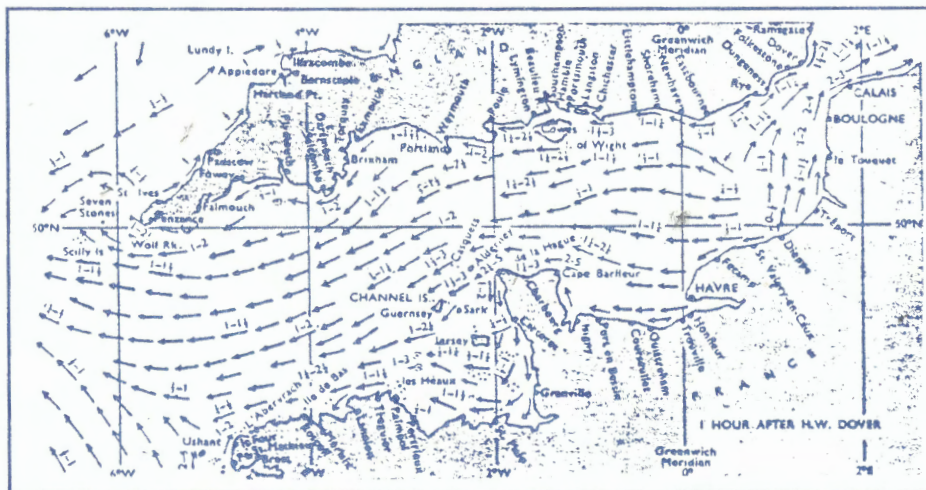
$$\begin{array}{l}
 \cancel{116.6 \text{ knots}} \quad 6.2 \text{ knots} \quad \text{ETA} \pm 1001300 \\
 3.8 \text{ knots} \quad \text{ETA} \pm 1500
 \end{array}$$

TIDES (Continued)

TIDAL STREAM ATLASES

The rate (strength) and set (direction) of tidal streams is shown. Tidal Stream Atlases - each atlas has a set of charts covering the same area, and each chart shows the rate and set of the tidal streams for each hour before and after high water at a Standard Point.

The set of the stream is shown by arrows which are graded in weight to indicate the rate. Thus $\rightarrow$ indicates a weak stream, and $\rightarrow$ indicates a strong stream.



TIDAL DIAMONDS

On some charts there are diamonds to indicate the rate and set of tidal streams at the positions concerned. On the chart a diamond is shown with a letter inside it, thus 

In a box insert, under a similar diamond, there is shown the latitude and longitude of the position where the observations were made and a table which gives the set, spring rate and neap rate for each hour before and after HW at the Standard Port nominated. Where appropriate the normal river current is included.

		A		B	
		51°41'.8N 5°05'.5W			
	Hours	Dir	Rate Sp	(kn) Np	Dir
Before HW	6		slack		
	5	013	0.3	0.1	
	4	023	0.8	0.4	
	3	027	1.1	0.5	
	2	023	1.0	0.5	
	1	017	0.7	0.	
	HW	354	0.3		
After HW	1	214	0.5		
	2	207	0.9		
	3	207			

TIDAL RANGE

The difference between High Water and the preceding or succeeding low water in metres is called the range.

HEIGHT OF TIDE AND THE RULE OF TWELFTHS

The tide does not rise or fall at a constant rate. This rule is used for a quick approximation of height between high and low water. The rule assumes that the tide rises or falls as follows:

6 hours between high
and low tide

HOUR	TIDAL RANGE
1	1/12
2	2/12
3	3/12
4	3/12
5	2/12
6	1/12

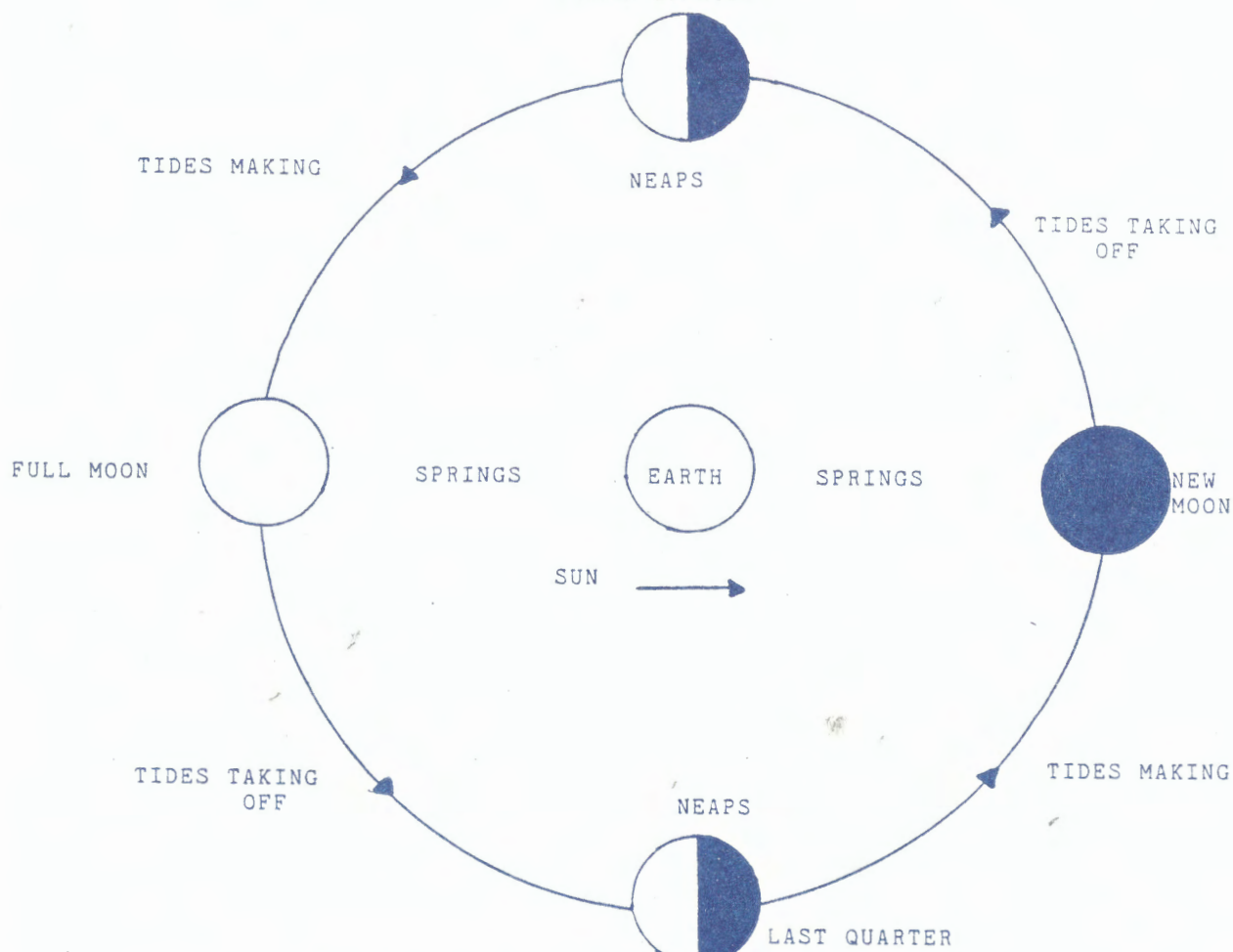
1/12 of its change
3/12
6/12
9/12
11/12
12/12

EXAMPLE :

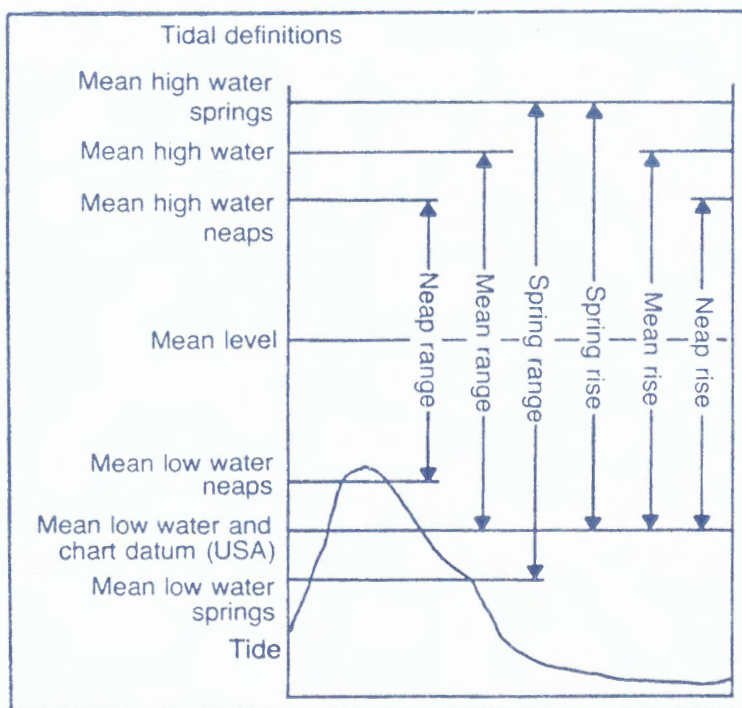
$$\frac{18}{612} \times \frac{6}{36}$$

With a range of 3.6m and 6 hour duration

HOUR	RANGE	HOURLY	TOTAL
1	1/12	0.3	0.3
2	2/12	0.6	0.9
3	3/12	0.9	1.8
4	3/12	0.9	2.7
5	2/12	0.6	3.3
6	1/12	0.3	3.6



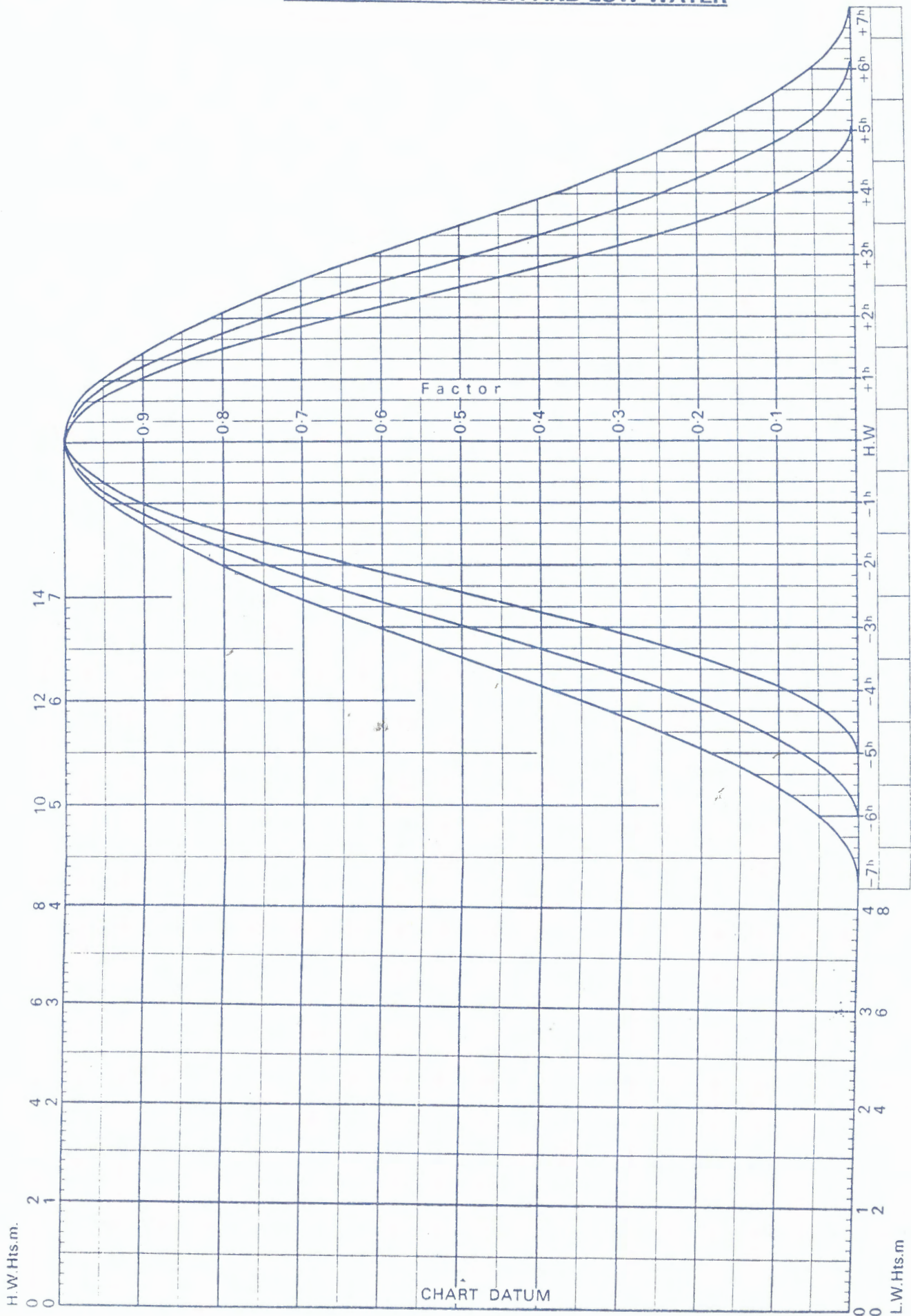
THE COMBINED TIDE-RAISING EFFECTS OF THE SUN AND MOON



Tide diagram showing average tidal heights.

Tide diagram showing average tidal heights

FOR FINDING THE HEIGHT OF THE TIDE AT
TIMES BETWEEN HIGH AND LOW WATER

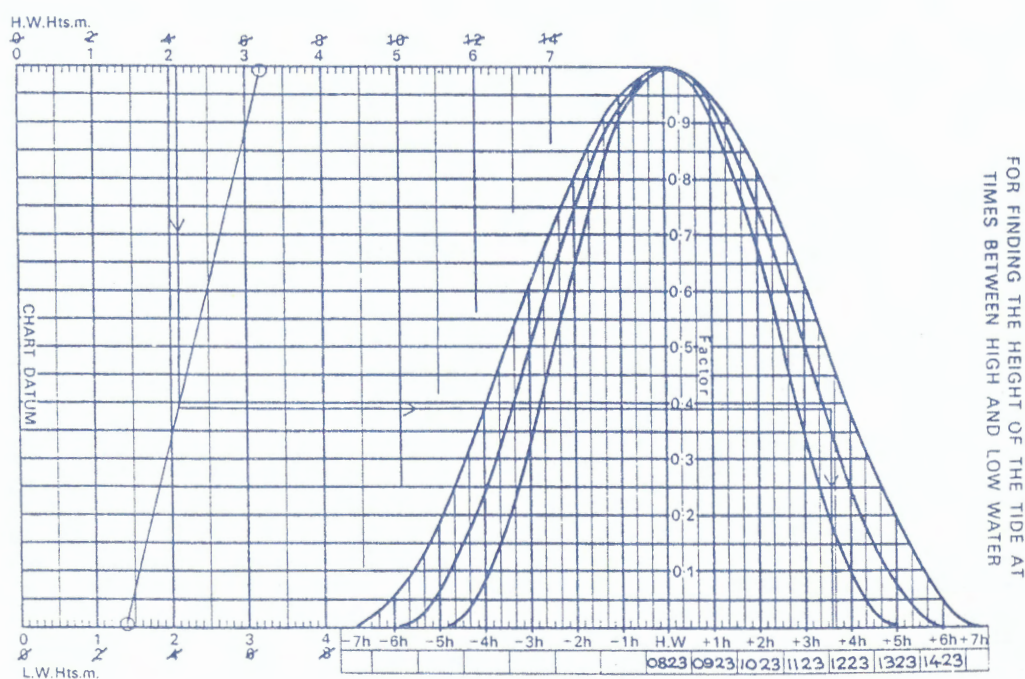


Example V: To find the time at which the midday tide falls to 2.1 m on 8th November at "Standard Port".

Extract from Part I		STANDARD PORT..... <u>Standard</u> TIME/HEIGHT REQUIRED... <u>2.1 (Midday falling)</u>	
NOVEMBER		SECONDARY PORT..... <u>—</u> DATE... <u>8 Nov</u> ...TIME ZONE... <u>-0700</u>	
8 F	0132	1.5	STANDARD PORT
	0823	3.2	
	1440	1.4	
	2115	3.0	
Seasonal change		Standard Port	
DIFFERENCES		7* <u>—</u> 8* <u>—</u> 9* <u>—</u> 10* <u>—</u>	
Seasonal change		Secondary port	
SECONDARY PORT		12 <u>—</u> 13 <u>—</u> 14 <u>—</u> 15 <u>—</u>	
Duration		16 <u>0617</u>	

- Notes: (i) This method is only suitable when the duration of rise or fall is between 5 and 7 hours and when there is no Shallow Water Correction (see page x).
- (ii) For Secondary Ports, first obtain the times and heights of high and low waters as in examples I, II or III and then proceed as below.
- (iii) The Data used in this example do not refer to the year of these tables.

- I On diagram on page xvii, plot heights of H.W. and L.W. occurring either side of required event and join by sloping line.
- II Enter H.W. time and those for half-tidal cycle covering required event.
- III From required height, proceed vertically to sloping line, thence horizontally to curve for Duration, interpolating as necessary between curves on diagram.
- IV Proceed vertically to Time Scale. Read off time.



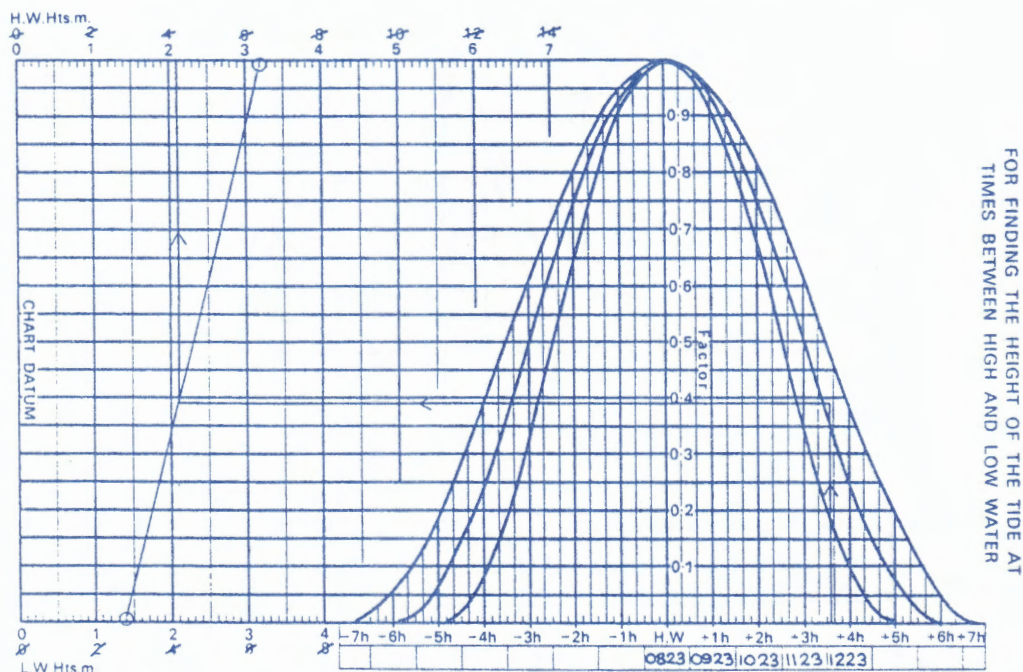
Example IV: To find the height of tide at 1200 on 8th November at "Standard Port".

Extract from Part I		STANDARD PORT..... <u>Standard</u> TIME/HEIGHT REQUIRED..... <u>1200</u>	
NOVEMBER		SECONDARY PORT..... <u>—</u> DATE..... <u>8 Nov</u> TIME ZONE..... <u>-0700</u>	
8	0132	1.5	STANDARD PORT
	0823	3.2	
F	1440	1.4	Seasonal change
	2115	3.0	
		DIFFERENCES	
		Seasonal change	
		SECONDARY PORT	
		Duration	

TIME		HEIGHT		RANGE
HW	LW	HW	LW	
1 0823	2 1440	3 3.2	4 1.4	5 1.8
Standard Port		6 —	6 —	
7* —	8* —	9* —	10* —	
Secondary port		11 —	11 —	
12 —	13 —	14 —	15 —	
16 0617				

- Notes: (i) This method is only suitable when the duration of rise or fall is between 5 and 7 hours and when there is no Shallow Water Correction (see page x).
- (ii) For Secondary Ports, first obtain the times and heights of high and low waters as in examples I, II or III and then proceed as below.
- (iii) The Data used in this example do not refer to the year of these tables.

- I On diagram on page xvii, plot heights of H.W. and L.W. occurring either side of required event and join by sloping line.
- II Enter H.W. time and sufficient others to embrace required time.
- III From required time, proceed vertically to curve for Duration, interpolating as necessary between curves on diagram.
- IV Proceed horizontally to sloping line, thence vertically to Height Scale. Read off height.

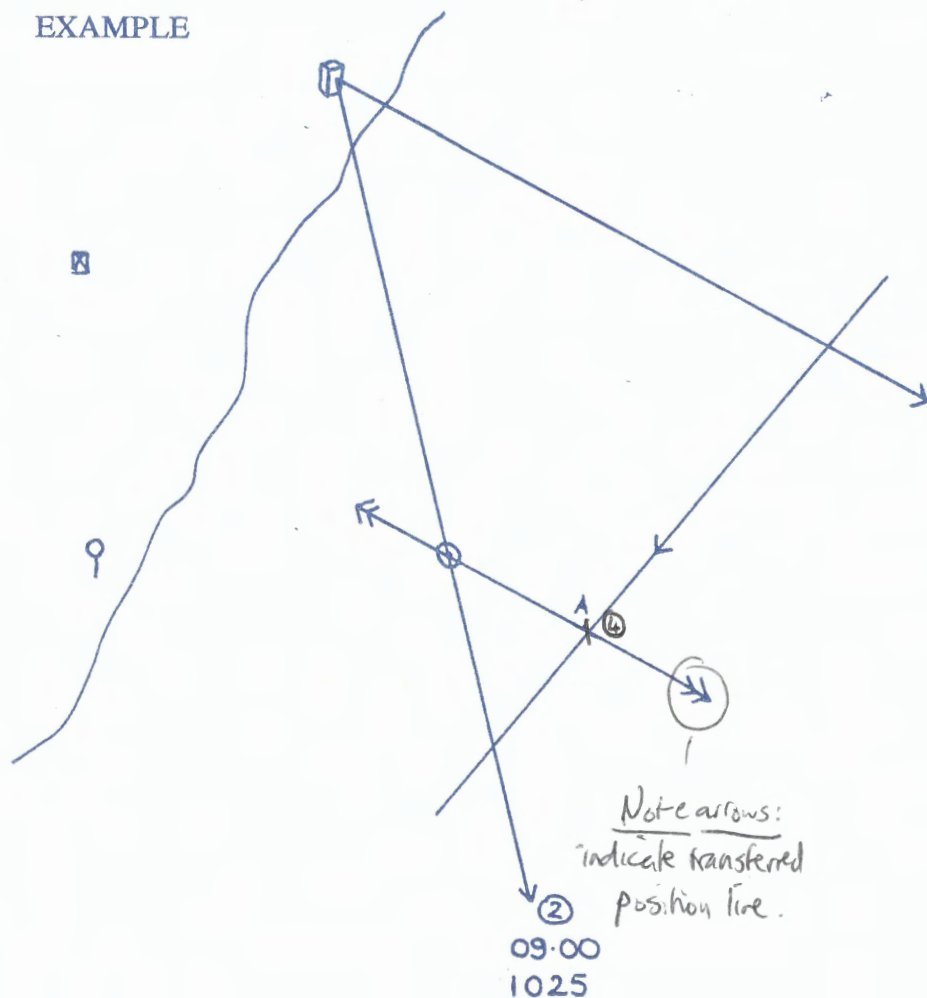


THE RUNNING FIX:

This method is used when there is only one suitable object visible on which to take a bearing.

METHOD

1. Take a bearing of the object and take a log reading.
2. Convert the bearing to True and lay it off on the chart. Mark the time and log reading.
3. Proceed on course for 3 to 5 miles and take another bearing of the same object. Note the log reading.
4. Convert the second bearing to true and lay off on the chart. Mark the time and log reading.
5. Draw in the course line from anywhere along the first position line. Mark off the distance run (ie. the difference between the two log readings). Call this Point A.
6. Position the parallel-ruler along the first bearing and transfer it to run through Point A. Draw a line through A.
7. Where the first bearing transferred through A cuts the second bearing is the boat's position.

EXAMPLE

- ① Plot course steered.
- ② Take a bearing and identify on chart, first bearing.
- ③ After period, take second bearing.
- ④ Mark off on course line the period that you travelled.
- ⑤ Using parallel rule, transfer first bearing onto chart. Where first and second bearing intersect that is your position.

A small error is incurred in a running fix. After two or more consecutive running fixes the error will be eliminated.

EXERCISE 10RUNNING FIX

CHART SAN 135

AT 0200 OUR ESTIMATED POSITION IS $29^{\circ}39'.1$ S
 $31^{\circ}18'$ E

TAKE A RUNNING FIX ON UMHLANGA ROCKS LIGHT.

FIRST BEARING 270° at 0200SECOND BEARING 350° at 0400THE COURSE STEERED BETWEEN THE TWO BEARINGS IS 219° .

BOAT SPEED = 5KTS

PLOT POSITION AT 0400

$\begin{matrix} V^+ \\ E^- \end{matrix}$ $\begin{matrix} W^- \\ E^+ \end{matrix}$

T V M D C

$256/20^{\circ}W$ $276/6^{\circ}E$ 270

$332/20^{\circ}W$ $352/20^{\circ}E$ 350

20420° $2245^{\circ}E$ 219°

— remember, these were taken with
 hand held compass.
 No deviation

Compass Deviation Card

0	N	3°W	180	S	5°E
10		3°W	190		5°E
20		4°W	200		5°E
30		5°W	210		5°E
40		6°W	220		5°E
50	NE	6°W	230	SW	5°E
60		5°W	240		5°E
70		5°W	250		5°E
80		4°W	260		6°E
90	E	3°W	270	W	6°E
100		3°W	280		6°E
110		2°W	290		5°E
120		1°W	300		4°E
130		1°W	310		3°E
140	SE	1°W	320	NW	2°E
150		1°E	330		1°E
160		2°E	340		0°E
170		3°E	350		2°E

EXERCISE 7OPTIONAL

Var 020° W
Dev 003° E

$\begin{matrix} \text{W}^+ \\ \text{E}^- \\ \text{T} \end{matrix}$
 $\begin{matrix} \text{U} \\ \text{M} \\ \text{D} \end{matrix}$
 $\begin{matrix} \text{C} \\ \text{E}^+ \end{matrix}$
 $\boxed{210^{\circ}} \text{ } 020^{\circ} \text{W } 230^{\circ} \text{ } \text{as } 227$
 $\boxed{250^{\circ}} \text{ } 020^{\circ} \text{W } 270^{\circ}$
 $310^{\circ} \text{ } 020^{\circ} \text{W } 330^{\circ}$
 080°

We are steering a course of 227° (C).

At 13:00 you take a bearing of 270° (M) on Umhlanga Rocks Lighthouse.

Log reading 240. *Difference between these is distance travelled.*

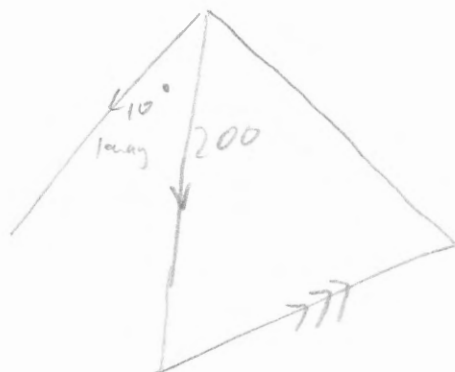
At 14:00 you take a second bearing on the light, it reads 330° (M). Log reading 245.

Your boat is being influenced by a SE wind giving a leeway of 10° and a current setting 080° (T) at 2 knots.

Plot your position at 14:00.

State compass course made good and speed made good.

ref colin\navpg.103



DIPPING DISTANCE

BOBBING THE LIGHT

The distance over which a light can be seen is called its range. If all other factors are ignored and the earth is regarded as being flat, the maximum range at which a light could be seen would depend upon its intensity; this is called the luminous range of the light.

When visibility is defined by the meteorological office as being 10 sea miles, the equivalent range of a light is called nominal range (i.e. the luminous range for a visibility of 10 sea miles).

The curvature of the earth, however, has to be taken into account, as light travels in a straight line and anyone below the path of the ray of light will not see the light until well within the luminous range.

When sailing away from or towards a light, a point is reached when the light appears to rise or dip on the horizon. This is called the rising or dipping distance of the light (geographical range). Obviously the higher the observer above sea level the higher the light above sea level, the greater the distance the light will be visible, dependent of course upon its intensity.

There are sets of nautical tables which, if entered with the height of eye and the height of the light, will give the distance off when the light is rising or dipping; these are called "Rising and Dipping Tables". The distance can also be found by using another set of tables which calculate the distance.

X LUMINOUS RANGE - given on chart (25M)

Is the maximum distance at which a light can be seen at a given time, as determined by the intensity of the light and the meteorological visibility prevailing at the time. It takes no account of elevation, observer's height of eye, and curvature of the earth.

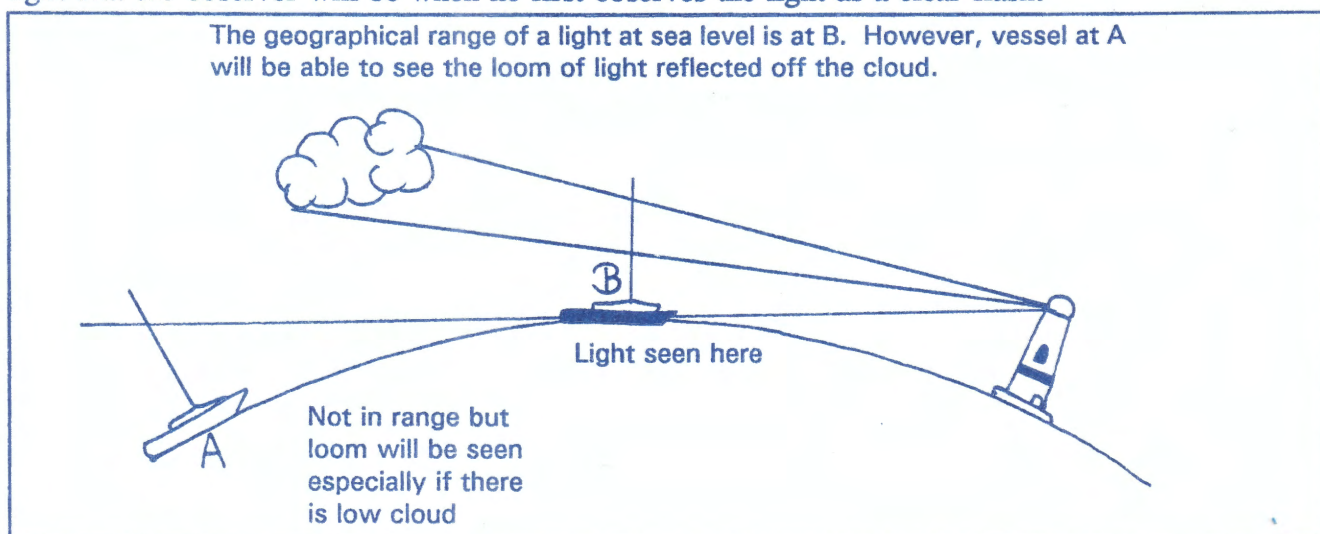
NOMINAL RANGE

Is the luminous range when the meteorological visibility is 10 sea miles.

X GEOGRAPHICAL RANGE

Is the maximum distance at which a light can theoretically reach an observer, as limited only by the curvature of the earth, refraction and the elevation of the light and height of the eye of the observer. See "Geographic Range Table" on the following pages.

Therefore by entering the height of eye of the observer and the elevation of the lighthouse into the GEOGRAPHICAL RANGE TABLE the intersection of the two columns will give the distance off the light that the observer will be when he first observes the light as a clear flash.



GEOGRAPHICAL RANGE TABLE

Elevation		Height of Eye of Observer in metres																							
m	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30	35	40	45		
Range in Sea Miles																									
0	2.0	2.9	3.5	4.1	4.5	5.0	5.4	5.7	6.1	6.4	7.0	7.6	8.1	8.6	9.1	9.5	10.0	10.4	10.7	11.1	12.0	12.8	13.6		
1	4.1	4.9	5.5	6.1	6.6	7.0	7.4	7.8	8.1	8.5	9.1	9.6	10.2	10.6	11.1	11.6	12.0	12.4	12.8	13.2	14.0	14.9	15.7		
2	4.9	5.7	6.4	6.9	7.4	7.8	8.2	8.6	9.0	9.3	9.9	10.5	11.0	11.5	12.0	12.4	12.8	13.2	13.6	14.0	14.9	15.7	16.5		
3	5.5	6.4	7.0	7.6	8.1	8.5	8.9	9.3	9.6	9.9	10.6	11.1	11.6	12.1	12.6	13.0	13.5	13.9	14.3	14.6	15.5	16.4	17.1		
4	6.1	6.9	7.6	8.1	8.6	9.0	9.4	9.8	10.2	10.5	11.1	11.7	12.2	12.7	13.1	13.6	14.0	14.4	14.8	15.2	16.1	16.9	17.7		
5	6.6	7.4	8.1	8.6	9.1	9.5	9.9	10.3	10.6	11.0	11.6	12.1	12.7	13.2	13.6	14.1	14.5	14.9	15.3	15.7	16.6	17.4	18.2		
6	7.0	7.8	8.5	9.0	9.5	9.9	10.3	10.7	11.1	11.4	12.0	12.6	13.1	13.6	14.1	14.5	14.9	15.3	15.7	16.1	17.0	17.8	18.6		
7	7.4	8.2	8.9	9.4	9.9	10.3	10.7	11.1	11.5	11.8	12.4	13.0	13.5	14.0	14.5	14.9	15.3	15.7	16.1	16.5	17.4	18.2	19.0		
8	7.8	8.6	9.3	9.8	10.3	10.7	11.1	11.5	11.8	12.2	12.8	13.3	13.9	14.4	14.8	15.3	15.7	16.1	16.5	16.9	17.8	18.6	19.4		
9	8.1	9.0	9.6	10.2	10.6	11.1	11.5	11.8	12.2	12.5	13.1	13.7	14.2	14.7	15.2	15.6	16.0	16.4	16.8	17.2	18.1	18.9	19.7		
10	8.5	9.3	9.9	10.5	11.0	11.4	11.8	12.2	12.5	12.8	13.5	14.0	14.5	15.0	15.5	15.9	16.4	16.8	17.2	17.5	18.4	19.3	20.0		
11	8.8	9.6	10.3	10.8	11.3	11.7	12.1	12.5	12.8	13.2	13.8	14.3	14.9	15.4	15.8	16.3	16.7	17.1	17.5	17.9	18.8	19.6	20.4		
12	9.1	9.9	10.6	11.1	11.6	12.0	12.4	12.8	13.1	13.5	14.1	14.6	15.2	15.7	16.1	16.6	17.0	17.4	17.8	18.2	19.1	19.9	20.7		
13	9.4	10.2	10.8	11.4	11.9	12.3	12.7	13.1	13.4	13.7	14.4	14.9	15.4	15.9	16.4	16.8	17.3	17.7	18.1	18.4	19.3	20.2	20.9		
14	9.6	10.5	11.1	11.7	12.1	12.6	13.0	13.3	13.7	14.0	14.6	15.2	15.7	16.2	16.7	17.1	17.6	18.0	18.3	18.7	19.6	20.4	21.2		
15	9.9	10.7	11.4	11.9	12.4	12.8	13.2	13.6	14.0	14.3	14.9	15.5	16.0	16.5	17.0	17.4	17.8	18.2	18.6	19.0	19.9	20.7	21.5		
16	10.2	11.0	11.6	12.2	12.7	13.1	13.5	13.9	14.2	14.5	15.2	15.7	16.2	16.7	17.2	17.7	18.1	18.5	18.9	19.2	20.1	21.0	21.7		
17	10.4	11.2	11.9	12.4	12.9	13.3	13.7	14.1	14.5	14.8	15.4	16.0	16.5	17.0	17.4	17.9	18.3	18.7	19.1	19.5	20.4	21.2	22.0		
18	10.6	11.5	12.1	12.7	13.2	13.6	14.0	14.4	14.7	15.0	15.7	16.2	16.7	17.2	17.7	18.1	18.6	19.0	19.4	19.7	20.6	21.5	22.2		
19	10.9	11.7	12.4	12.9	13.4	13.8	14.2	14.6	14.9	15.3	15.9	16.5	17.0	17.5	17.9	18.4	18.8	19.2	19.6	20.0	20.9	21.7	22.5		
20	11.1	12.0	12.6	13.1	13.6	14.1	14.5	14.8	15.2	15.5	16.1	16.7	17.2	17.7	18.2	18.6	19.0	19.4	19.8	20.2	21.1	21.9	22.7		
22	11.6	12.4	13.0	13.6	14.1	14.5	14.9	15.3	15.6	15.9	16.6	17.1	17.7	18.1	18.6	19.1	19.5	19.9	20.3	20.7	21.5	22.4	23.2		
24	12.0	12.8	13.5	14.0	14.5	14.9	15.3	15.7	16.0	16.4	17.0	17.6	18.1	18.6	19.0	19.5	19.9	20.3	20.7	21.1	22.0	22.8	23.6		
26	12.4	13.2	13.9	14.4	14.9	15.3	15.7	16.1	16.4	16.8	17.4	18.0	18.5	19.0	19.4	19.9	20.3	20.7	21.1	21.5	22.4	23.2	24.0		
28	12.8	13.6	14.3	14.8	15.3	15.7	16.1	16.5	16.8	17.2	17.8	18.3	18.9	19.4	19.8	20.3	20.7	21.1	21.5	21.9	22.8	23.6	24.4		

m	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30	35	40	45
30	13.2	14.0	14.6	15.2	15.7	16.1	16.5	16.9	17.2	17.5	18.2	18.7	19.2	19.7	20.2	20.7	21.1	21.5	21.9	22.2	23.1	24.0	24.7
35	14.0	14.9	15.5	16.1	16.6	17.0	17.4	17.8	18.1	18.4	19.1	19.6	20.1	20.6	21.1	21.5	22.0	22.4	22.8	23.1	24.0	24.9	25.6
40	14.9	15.7	16.4	16.9	17.4	17.8	18.2	18.6	18.9	19.3	19.9	20.4	21.0	21.5	21.9	22.4	22.8	23.2	23.6	24.0	24.9	25.7	26.5
45	15.7	16.5	17.1	17.7	18.2	18.6	19.0	19.4	19.7	20.0	20.7	21.2	21.7	22.2	22.7	23.2	23.6	24.0	24.4	24.7	25.6	26.5	27.2
50	16.4	17.2	17.9	18.4	18.9	19.3	19.7	20.1	20.5	20.8	21.4	22.0	22.5	23.0	23.4	23.9	24.3	24.7	25.1	25.5	26.4	27.2	28.0
55	17.1	17.9	18.6	19.1	19.6	20.0	20.4	20.8	21.2	21.5	22.1	22.7	23.2	23.7	24.1	24.6	25.0	25.4	25.8	26.2	27.1	27.9	28.7
60	17.8	18.6	19.3	19.8	20.3	20.7	21.1	21.5	21.8	22.2	22.8	23.3	23.9	24.3	24.8	25.3	25.7	26.1	26.5	26.9	27.7	28.6	29.4
65	18.4	19.2	19.9	20.4	20.9	21.4	21.7	22.1	22.5	22.8	23.4	24.0	24.5	25.0	25.5	25.9	26.3	26.7	27.1	27.5	28.4	29.2	30.0
70	19.0	19.9	20.5	21.1	21.5	22.0	22.4	22.7	23.1	23.4	24.0	24.6	25.1	25.6	26.1	26.5	26.9	27.4	27.7	28.1	29.0	29.8	30.6
75	19.6	20.5	21.1	21.7	22.1	22.6	23.0	23.3	23.7	24.0	24.6	25.2	25.7	26.2	26.7	27.1	27.5	27.9	28.3	28.7	29.6	30.4	31.2
80	20.2	21.0	21.7	22.2	22.7	23.1	23.5	23.9	24.3	24.6	25.2	25.8	26.3	26.8	27.3	27.7	28.1	28.5	28.9	29.3	30.2	31.0	31.8
85	20.8	21.6	22.2	22.8	23.3	23.7	24.1	24.5	24.8	25.1	25.8	26.3	26.9	27.3	27.8	28.3	28.7	29.1	29.5	29.9	30.7	31.6	32.4
90	21.3	22.1	22.8	23.3	23.8	24.2	24.6	25.0	25.4	25.7	26.3	26.9	27.4	27.9	28.4	28.8	29.2	29.6	30.0	30.4	31.3	32.1	32.9
95	21.8	22.7	23.3	23.9	24.3	24.8	25.2	25.5	25.9	26.2	26.8	27.4	27.9	28.4	28.9	29.3	29.7	30.1	30.5	30.9	31.8	32.6	33.4
100	22.3	23.2	23.8	24.4	24.9	25.3	25.7	26.1	26.4	26.7	27.3	27.9	28.4	28.9	29.4	29.8	30.3	30.7	31.1	31.4	32.4	33.2	33.9
110	23.3	24.2	24.8	25.4	25.8	26.3	26.7	27.0	27.4	27.7	28.3	28.9	29.4	29.9	30.4	30.8	31.3	31.7	32.1	32.4	33.3	34.1	34.9
120	24.3	25.1	25.8	26.3	26.8	27.2	27.6	28.0	28.3	28.7	29.3	29.8	30.4	30.9	31.3	31.8	32.2	32.6	33.0	33.4	34.3	35.1	35.9
130	25.2	26.0	26.7	27.2	27.7	28.1	28.5	28.9	29.2	29.6	30.2	30.8	31.3	31.8	32.2	32.7	33.1	33.5	33.9	34.3	35.2	36.0	36.8
140	26.1	26.9	27.6	28.1	28.6	29.0	29.4	29.8	30.1	30.5	31.1	31.6	32.2	32.6	33.1	33.6	34.0	34.4	34.8	35.2	36.0	36.9	37.7
150	26.9	27.7	28.4	28.9	29.4	29.9	30.2	30.6	31.0	31.3	31.9	32.5	33.0	33.5	34.0	34.4	34.8	35.2	35.6	36.0	36.9	37.7	38.5
160	27.7	28.6	29.2	29.8	30.2	30.7	31.1	31.4	31.8	32.1	32.7	33.3	33.8	34.3	34.8	35.2	35.6	36.0	36.4	36.8	37.7	38.5	39.3
170	28.5	29.4	30.0	30.5	31.0	31.5	31.9	32.2	32.6	32.9	33.5	34.1	34.6	35.1	35.6	36.0	36.4	36.8	37.2	37.6	38.5	39.3	40.1
180	29.3	30.1	30.8	31.3	31.8	32.2	32.6	33.0	33.3	33.7	34.3	34.9	35.4	35.9	36.3	36.8	37.2	37.6	38.0	38.4	39.3	40.1	40.9
190	30.0	30.9	31.5	32.1	32.5	33.0	33.4	33.7	34.1	34.4	35.0	35.6	36.1	36.6	37.1	37.5	37.9	38.4	38.7	39.1	40.0	40.8	41.6
200	30.8	31.6	32.2	32.8	33.3	33.7	34.1	34.5	34.8	35.1	35.8	36.3	36.8	37.3	37.8	38.3	38.7	39.1	39.5	39.8	40.7	41.6	42.3
220	32.2	33.0	33.6	34.2	34.7	35.1	35.5	35.9	36.2	36.5	37.2	37.7	38.3	38.7	39.2	39.7	40.1	40.5	40.9	41.4	42.1	43.0	43.8
240	33.5	34.3	35.0	35.5	36.0	36.4	36.8	37.2	37.6	37.9	38.5	39.1	39.6	40.1	40.4	41.0	41.4	41.8	42.2	42.6	43.5	44.3	45.1
260	34.8	35.6	36.3	36.8	37.3	37.7	38.1	38.5	38.8	39.2	39.8	40.4	40.9	41.4	41.8	42.3	42.7	43.1	43.5	43.9	44.8	45.6	46.4
280	36.0	36.9	37.5	38.0	38.5	39.0	39.4	39.7	40.1	40.4	41.0	41.6	42.1	42.6	43.1	43.5	43.9	44.3	44.7	45.1	46.0	46.8	47.6
300	37.2	38.1	38.7	39.2	39.7	40.2	40.6	40.9	41.3	41.6	42.2	42.8	43.3	43.8	44.3	44.7	45.1	45.5	45.9	46.3	47.2	48.0	48.8
320	38.4	39.2	39.9	40.4	40.9	41.3	41.7	42.1	42.4	42.8	43.4	43.9	44.5	45.0	45.4	45.9	46.3	46.7	47.1	47.5	48.3	49.2	50.0
340	39.5	40.3	41.0	41.5	42.0	42.4	42.8	43.2	43.5	43.9	44.5	45.1	45.6	46.1	46.5	47.0	47.4	47.8	48.2	48.6	49.5	50.3	51.1
360	40.6	41.4	42.1	42.6	43.1	43.5	43.9	44.3	44.6	45.0	45.6	46.1	46.6	47.2	47.6	48.1	48.5	48.9	49.3	49.7	50.6	51.4	52.2
380	41.6	42.5	43.1	43.7	44.1	44.6	45.0	45.3	45.7	46.0	46.6	47.2	47.7	48.2	48.6	49.1	49.5	50.0	50.3	50.7	51.6	52.4	53.2
400	42.7	43.5	44.1	44.7	45.2	45.6	46.0	46.4	46.7	47.0	47.7	48.2	48.7	49.2	49.7	50.1	50.6	51.0	51.4	51.7	52.6	53.5	54.2

BOBBING THE LIGHTEXERCISE 8

CHART SAN 135

A BEARING OBTAINED ON UMHLANGA ROCKS LIGHTHOUSE:

BEARING 255°(M) AS THE LIGHT BOBBED. (YOUR HEIGHT OF EYE IS 8')

PLOT AND GIVE LATITUDE AND LONGITUDE OF FIX.

TVMDC
235 20 25529°54'07 S
34°14'02 ECompass Deviation Card

0	N	3°W	180	S	5°E
10		3°W	190		6°E
20		4°W	200		5°E
30		5°W	210		5°E
40		6°W	220		5°E
50	NE	6°W	230	SW	5°E
60		5°W	240		5°E
70		5°W	250		5°E
80		4°W	260		6°E
90	E	3°W	270	W	6°E
100		3°W	280		6°E
110		2°W	290		5°E
120		1°W	300		4°E
130		1°W	310		3°E
140	SE	1°W	320	NW	2°E
150		1°E	330		1°E
160		2°E	340		0°E
170		3°E	350		2°E

HORIZONTAL SEXTANT ANGLE

If the sextant is turned so that it is held horizontally, it can be used to measure the angle subtended at the observer between two shore objects. A distance off is not obtained from a horizontal angle as from a vertical angle, but a position circle can be plotted. Two such circles can be obtained from three landmarks; where they intersect is the fix.

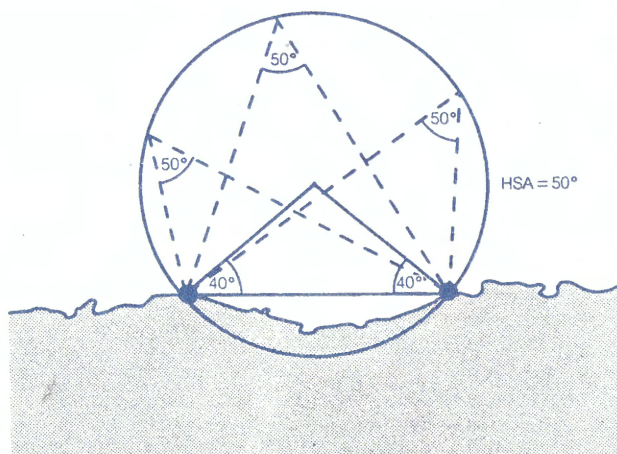


Fig 7.10 Constructing a position circle from a horizontal sextant angle between two objects of 50° , using method 1. The boat is somewhere on the circumference.

1. Draw a base line between the two objects, joining them together.
2. If the angle measured on the sextant is less than 90° , take it from 90° and lay off the resultant angle from each end of the base line on the same side as the boat.
3. If the angle measured is greater than 90° , take 90° from it and lay off the resultant angle from the base line on the opposite side to the boat.
4. The lines laid off from the base line intersect at the centre of the circle. The radius of the circle is from the centre to either object. The circle can now be drawn.

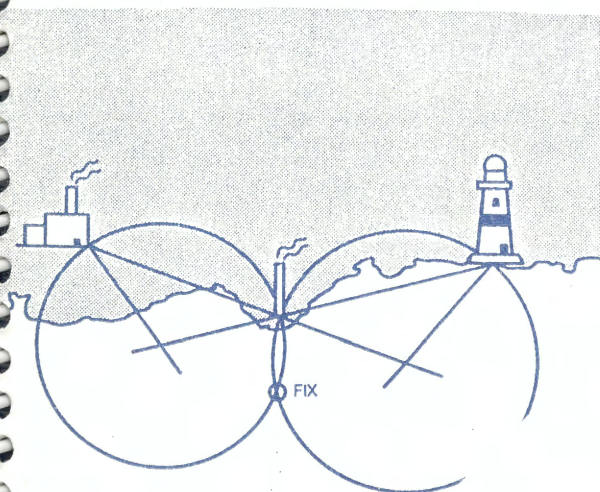


Figure 7.12 shows two position circles, the point of intersection being the fix.

When the three objects chosen are all on a circle which passes through the boat, then only one position circle can be obtained. Therefore choose objects which are along a straight line, where the middle object is nearer than the other two, or where the boat is inside a circle formed by the three objects.

Fig 7.12 Two horizontal sextant angles on three objects give a fix where the circles intersect.

PART THREE

AIDS TO NAVIGATION

SPEED AND DISTANCE (LOGS) :

The instrument used to measure speed and/or distance is called a log. Distance is measured in nautical miles.

1 nautical mile = ft or 1800 metres.

Speed is measured in nautical miles per hour generally known as knots.

5 knots = 5 nautical miles per hour.

1. Trailing Logs

A rotating impeller towed astern on a plaited line called a log line. The impeller drives a distance counter. This type of log is very reliable, accurate and robust but are easily fouled by seaweed and sometimes devoured by sharks!

2. Trailing Electronic Log

These are similar to the trailing log but the log line is an electric cable and is shorter. The cable transmits an electric pulse on each turn of the impeller.

3. Doppler Logs

These have a detector inside the hull (no hull penetration). They measure the Doppler shift in the water close to the hull by ultrasound. They require accurate and careful calibration and tend to overread in choppy conditions.

4. Pressure Logs

These measure by means of a probe through the hull, the static and impact pressure of the water.

5. Electromagnetic Logs

These logs use a rotating impeller which affects a magnetic field in the transducer and sends impulses to a display. The display converts the impulses into speed in knots and distance in nautical miles. The impeller is mounted on a through-hull fitting and can be drawn into the hull for inspection and cleaning while under way.

DEPTH SOUNDERS

The modern depth sounder is also called an Echo Sounder and works by generating a pulse of sound from a transducer in the hull, the pulse bounces off the sea bed and is picked up by a receiver. By measuring the time from generation of the pulse to receiving, the sounder records the depth of water under the keel. The depth is indicated either as a neon blip in a dial or as a trace on moving paper. Others show the depth in meters, fathoms or feet on a digital display. An alarm can be set to warn of shallow water.

THE LEAD-LINE

The old lead line is still used on small boats and is comforting to have as a back up in an emergency. It consists of a length of line weighted at one end and has depth measurement marking along its length. It is hung over the side of the boat and bounced on the bottom. The depth can be read off the markings on the line.

RADIO DIRECTION FINDING (RDF)

Many lighthouses around the coastlines of the world carry a radio transmitter which emit a constant radio signal suitably coded for identification. A receiver and tunable aerial is connected to a compass. The instrument is tuned and picks up the signal through an arc of 360° except for two areas. These areas are called the nulls and are silent. There is a null where the transmitter and receiver are in alignment i.e. when you point directly at the beacon or 180° away. When the instrument picks up the null a reading is taken from the compass and can be plotted on the chart as a bearing. Radio signals can be picked up 100 nautical miles offshore therefore rendering a RDF an asset to coastal navigation and navigating in bad visibility or fog.

RADAR

Radar has a visual display unit which shows any area or object which projects above the water level. Small vessels do not show up well unless they carry a radar reflector at least 5m above the water level.

ABANDON SHIP ROUTINE

1. Brief all crew before departure on procedure/individual tasks.
2. Prepare abandon ship gear in advance.
3. Rehearsal
4. Only on command of captain.
5. Do not abandon ship unless absolutely essential.
6. Individual tasks:
Lifecraft out, tied on, ready for "DITCH" order
Spare water container(s)
First aid box (sea sickness suppositories)
Extra food
Warm clothing
Grab/survival bag containing : mirror, EPIRB, torches, spare batteries/bulbs, food, fishing gear - (knives, string water still), compass - (chart, pencil, pad etc.), hand held VHF Radio, anything else you would need.
7. Send out mayday call
8. Activate EPIRB/ARGUS.
9. Take water proof bag (passports/ID's ships papers, personal papers, cash etc.)
10. Stay with your ship for as long as possible as it is easier to see than your life raft.

ACTION WHEN EXPECTING HEAVY WEATHER

1. Take fix
2. Duty crew wear : warm clothing, oilies, harnesses (clip on)
3. Rest off-duty crew
4. Reef/storm sails or remove all sails
5. Tie down/secure all loose equipment
6. All to have hot meals - may be last chance for long time
7. Fill hot water thermo flasks for hot drinks later when stove unusable.
8. Consider storm tactics - prepare drag lines, drogues
9. If possible, get away from shipping lanes.
10. If possible, report position by radio.

ACTION WHEN EXPECTING FOG

1. Take fix.
2. All crew on deck, wearing harnesses - NOT clipped on - life jackets on.
3. All crew as 'lookout' on deck.
4. Engine on, safe speed, nav lights on.
5. Life raft/abandon ship gear loose on deck, ready
6. Radar reflector up
7. Sound signal "D" every 1 minute.
8. Listen for other vessels (engines, sound signals etc.)
9. If possible get clear of shipping lanes
10. If possible report position by radio.

There are four things which a yachtsman can do to reduce the risk of being run down in fog.

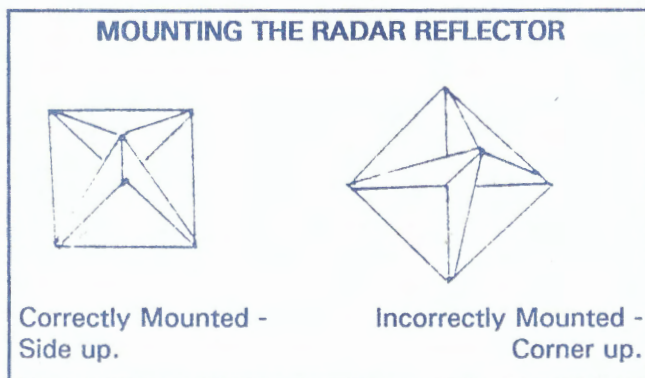
Use a radar reflector

Keep a good lookout by both sight and sound.

Be ready to take immediate and drastic avoiding action.

Keep clear of shipping channels.

A radar reflector, correctly mounted (see Fig.10) increases the chance of a yacht being detected on radar. In general, the larger the reflector the more effective it is likely to be. Reflectors smaller than the 50 cm size are unlikely to be of very much use.



MARINE SOUND SIGNALS

Based on INTERNATIONAL REGULATIONS FOR PREVENTING
COLLISIONS AT SEA

EQUIPMENT:

Vessels : Less than 12 metres	Any efficient sound source
Vessels : 12 - 100 metres	Whistle/Horn and bell
Vessels : greater than 100 metres	Whistle/Horn, bell AND Gong
(If electrical or mechanical, must also be manually operable)	

TURNING: TO STARBOARD:

(Short blasts, one second duration.

TO PORT:

PROPELLER, ASTERN:

(One second interval between blasts)

MANOEUVRING:

I intend overtaking on your **starboard** side:
(Long blasts 4 - 6 seconds duration)



I intend overtaking on your **port** side:
(Long blasts 4 - 6 seconds duration)



I agree to being **overtaken** and will make room
for you:



Your intentions are **not clear**:



Approaching bend in channel/**obscured visibility**:
(Also used as reply in same situation)

RESTRICTED VISIBILITY:

Powered, making way:



Powered, under way, no way on:



Restricted vessel e.g. towing, not under
command, sailing, draught, fishing etc.):



Towed vessel, or last vessel of tow if
manned. Sounded after towing vessel's blasts:
(Repeated every 2 minutes)

ANCHOR:

Vessels : less than 100 metres : 5 seconds rapid ringing

Vessels : greater than 100 metres : 5 sec. rapid ringing, followed
(Repeated every one minute) by a gong in aft

VESSEL AGROUND:

Ring bell 3 times, then 5 sec rapid ringing, then ring bell 3 times.

Ring bell 3 times, then 5 sec sound gong, then ring bell 3 times.

Pilot vessel on duty : For identification



DISTRESS: Continuous blast or "S.O.S."



PASSAGE PLANNING

A lot of preparation can be done before the passage charts should be put in order of use in a folder. Large scale charts for harbour entrances and hazardous areas and small scale charts for the whole passage. The charts should all be corrected to date with the latest Notices to Mariners.

Check that all required Sailing Directions, Nautical Almanac Tide Tables, Tidal Stream Atlas and other reference books are on board.

Check all safety equipment engine, supplies, fuel, water, gas and do a general check of all the equipment on the boat to ensure that everything is in working order.

Check that the sails are in a good state of repair. Brief the crew on the use of gear, sail hoisting, stowage, man-overboard and abandon ship drills, and issue personal safety equipment. Arrange a watch system and cooking duties.

Plot the proposed courses to gain a rough idea of the passage taking into account the tides, current set and drift, radio beacons, buoys and lights. Read the Sailing Directions of the area. Ensure that all ships papers are on board and draw up a flight plan.

Compile a Victualling List and allow for $\frac{1}{3}$ extra time.

Stock boat and make sure all gear, supplies, fuel etc. is all stowed in case of heavy weather. Get a weather report from the local meteorological office.

Visit the Customs office and obtain information on the requirements for port of departure and port of arrival. Find out about the local regulations. File flight plan at the Port Captain's office.

Once under way keep an hourly record in the Yachts Log (in ink as the log constitutes a legal document) noting the time, log, course, wind, barometric pressure, speed, whether under motor or sail and any other points of interest.

SPINNAKERS

In a cruising yacht, which can if necessary afford to make temporary changes of course while the spinnaker is hoisted or lowered, it should be perfectly easy to handle this sail with just a little foresight and practice.

In smaller yachts the spinnaker sheets/guys are interchangeable, the windward one to the end of the spinnaker pole being called the guy and the leeward one to the clew of the spinnaker being the sheet. On the opposite gybe their roles are reversed. Larger yachts have separate guys and sheets. The sheets/guys are led outboard of all other rigging to blocks fitted right aft each side of the boat, and thence to winches.

The spinnaker pole is clipped to a traveller on a track secured to the forward side of the mast, so that the height of the heel of the pole can be adjusted according to the wind strength and the point of sailing. A lift and a downhaul control the height of the outer end of the spinnaker pole.

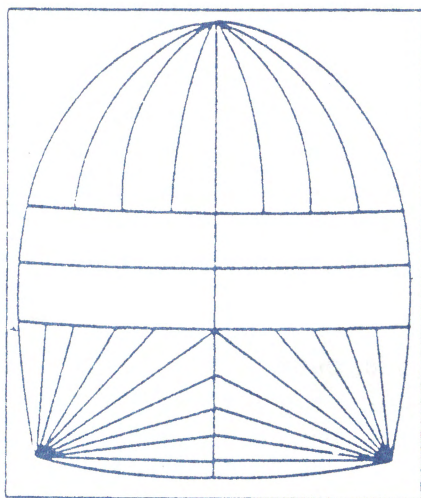
To hoist the spinnaker first make sure that it is properly flaked down in its bag with no twists. Attach the bag to the pulpit, or to the guardrails on the lee side, under the jib. Rig the spinnaker guy along the windward side, outboard of everything, through the pole end fitting, and clip it to the tack of the sail. Rig the sheet on the lee side, outboard of everything, and clip it to the spinnaker clew. Pass the halyard under the foot of the headsail, outboard and clear of everything, and clip it to the head of the sail, which has a swivel. Attach the heel of the pole to the mast and heave on the pole lift so that the pole is at right angles to the mast. Take down the slack on the pole downhaul. With the boat running roughly downwind it is easy to hoist the spinnaker quickly under the lee of the headsail and mainsail, then trim the guy and the sheet to set the sail. Then drop the headsail. The pole should be trimmed at right angles to the apparent wind, and its height on the mast adjusted so that the tack and clew of the sail are about the same height. Keep the spinnaker sheet eased out as far as possible without the luff of the sail falling in .

Gybing procedure depends on the gear fitted. With the main sheeted well in amidships and the boat's stern to the wind, the spinnaker guy is released from the pole end fitting and becomes the new sheet. By controlling the two sheets the spinnaker should be kept drawing while the pole is moved across and clipped onto the new guy (the previous sheet). The gybing of the mainsail can then be completed.

Lowering (handing) the spinnaker is simple if the boat is running downwind. First hoist the headsail. Then ease the guy so that the pole swings forward near the forestay. Release the tack of the sail from the pole end fitting. One crew member then gathers in all the foot of the sail somewhere aft of the shrouds on the lee side. When he is ready to gather in the rest of the sail, lower the halyard steadily. The sail is then pulled inboard and stowed down below. Clear away the spinnaker pole and secure all the gear.

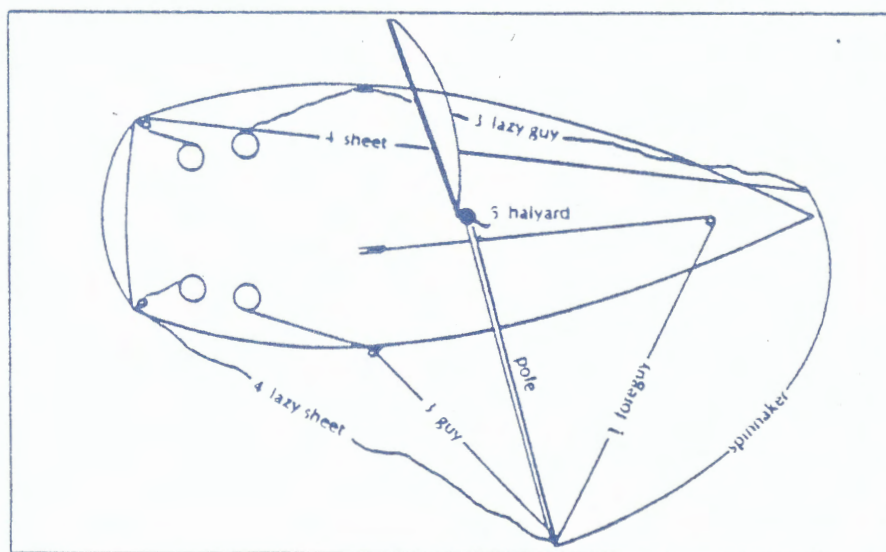
Different cuts, and hence shapes, of spinnaker are available for best performance on different points of sailing. Originally the spinnaker was essentially a running sail: now, using modern sailcloth and new cutting techniques, spinnakers can be carried effectively with the wind well forward of the beam.

Since one of the requirements of a spinnaker is that it must support itself in the air, it is necessary to use a material which is as light as possible, consistent with strength and resistance to stretch. Normally nylon cloth is used, typically about 1 - 1½ oz/sq yard, reinforced to discourage it from ripping. Reaching spinnakers are made of slightly heavier cloth because it is more important that they retain their shape. It is important not to carry a spinnaker in wind speeds greater than that for which it is designed.



Nylon Weight	Boat size	Run	Broad reach	Beam reach	Close reach
0.5 oz	Under 30ft (9m)	6	6	5	-
	Over 30ft (9m)	5	5	4	-
0.75 oz	Under 30ft (9m)	22	17	14	12
	30 - 40ft (9-12m)	16	13	12	11
	Over 40ft (12m)	13	12	11	9
1.5 oz	Under 30ft (9m)	30	36	22	15
	Over 30ft (9m)	26	23	17	13

Suggested maximum apparent wind speeds in knots for different weights of spinnaker cloth and on different points of sailing.



LIST OF REFERENCES

THIS SAILBOAT CRUISING	J D SLEIGHTHOLME
THIS IS ROUGH WEATHER CRUISING	ERROL BRUCE
SAIL AND POWER - A MANUAL OF SEAMANSHIP	R HENDERSON & B S DUNBAR
CRUISING UNDER SAIL	ERIC HISCOCK
FURTHER OFFSHORE	JOHN ILLINGWORTH
SAN HO-15 INTERNATIONAL RULES FOR PREVENTING COLLISIONS AT SEA	
SMALL BOAT SKIPPERS SAFETY BOOK	DENNY DESOUTTER

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F.C. BONNET

NOT UNDER COMMAND

AGROUND

RESTRICTED ABILITY
TO MANOEUVRE

DREDGING + UNDERWATER
OPERATIONS

TUG + TOW UNABLE TO
DEVIATE FROM COURSE

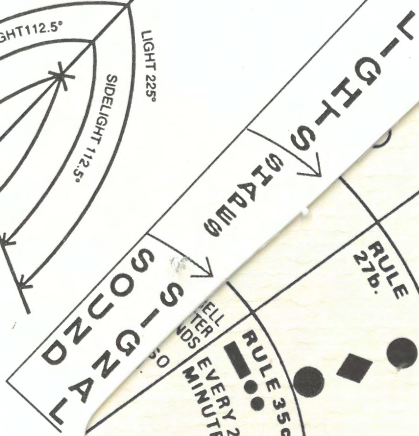
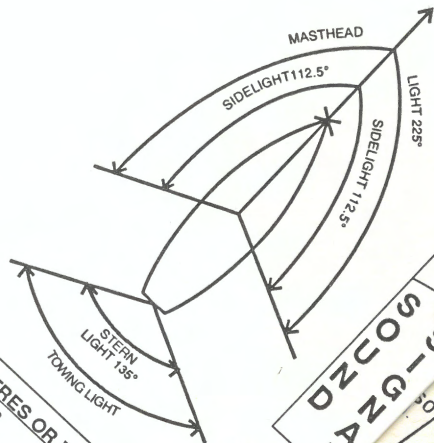
VESSEL CONSTRAINED
BY HER DRAUGHT

FISHING

FISHING - OTHER THAN
TRAWLING

MINE CLEARANCE

PILOT VESSELS



VESSELS 50 METRES OR MORE IN LENGTH
MASTHEAD - 6 MILES
STERNLIGHT - 6 MILES
SIDE LIGHTS - 3 MILES
TOWING LIGHT - 3 MILES

VESSELS 12 METRES - 50 METRES
MASTHEAD - 5 MILES
STERNLIGHT - 3 MILES
SIDE LIGHTS - 2 MILES
TOWING LIGHT - 2 MILES

VESSELS LESS THAN 12 METRES IN LENGTH
MASTHEAD - 2 MILES
STERNLIGHT - 1 MILE
SIDE LIGHTS - 1 MILE

● I AM ALTERING MY COURSE TO STARBOARD
● I AM ALTERING MY COURSE TO PORT
● I AM OPERATING ASTERN PROPULSION

PROLONGED BLAST - BLAST OF 4 TO 6 SECONDS DURATION
SHORT BLAST - BLAST OF 1 SECOND DURATION

● I INTEND TO OVERTAKE YOU ON YOUR PORT SIDE
● I INTEND TO OVERTAKE YOU ON YOUR STARBOARD SIDE
● ACKNOWLEDGEMENT SIGNAL FOR ABOVE

VESSEL AT ANCHOR
GREATER THAN 100 METRES

VESSEL AT ANCHOR

VESSEL UNDER OARS

TOWING POWER DRIVEN
VESSEL
LESS THAN 50 METRES

TOWING POWER DRIVEN VESSEL
GREATER THAN 50 METRES

POWER DRIVEN VESSEL
PUSHING

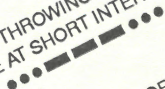
TOWING ALONGSIDE
INCONSPICUOUS, PARTLY
SUBMERGED VESSEL OR
OBJECT.

SAILING VESSELS

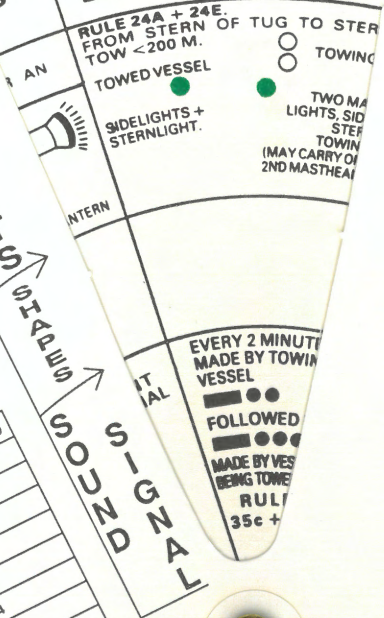
POWER DRIVEN VESSEL

POWER DRIVEN
VESSELS
LESS THAN 12 METRES
AND 7 KNOTS

DISTANCE CONVERSION TABLE. METRES - FEET (APPROX.)	
METRES	FEET
7	23
12	40
20	66
25	82
50	164
100	328
150	492
200	656
1000	3280

- A.) A GUN OR OTHER EXPLOSIVE SIGNAL FIRED AT INTERVALS OF ABOUT A MINUTE.
- B.) A CONTINUOUS SOUNDING WITH ANY FOG SIGNALING APPARATUS.
- C.) ROCKETS OR SHELLS THROWING RED STARS FIRED ONE AT A TIME AT SHORT INTERVALS.
- D.) S.O.S. MORSE CODE 
- E.) SPOKEN WORD MAYDAY.
- F.) CODE FLAGS N.C.
- G.) SQUARE FLAG WITH BALL ABOVE OR BELOW.

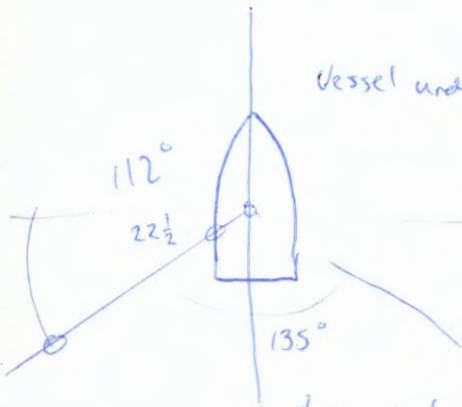
- H.) FLAMES ON A VESSEL (FROM TAR/OIL BARREL).
 - I.) ROCKET PARACHUTE FLARE OR HAND FLARE SHOWING A RED LIGHT.
 - J.) SMOKE SIGNAL GIVING OFF ORANGE SMOKE.
 - K.) SLOWLY RAISING AND LOWERING ARMS.
 - L.) RADIOTELEGRAPH ALARM SIGNAL.
 - M.) SIGNALS TRANSMITTED BY EMERGENCY POSITION INDICATING RADIO BEACONS.
- INTERNATIONAL CODE OF SIGNALS, MERCHANT SHIP S.A.R. MANUAL
1. PIECE OF ORANGE COLOURED CANVAS WITH EITHER A BLACK SQUARE OR CIRCLE OR OTHER APPROPRIATE SYMBOL. (FOR IDENTIFICATION FROM THE AIR).
 2. A DYE MARKER.



$11\frac{1}{4}^\circ$ to each point

NOTES

3 red balls - contained by her draught - equivalent to cylinder



vessel under way:

1 red light

2 points abaft beam port beam

1 green light 2 points abaft starboard beam.

covering arc of 112°

stern light shall exhibit a white light of 135°



If under power, white light shown, arc 225, on mast, higher than green or white light.

Not all round light.

Second white light, same arc, lower than first white light, indicates vessel ~~less~~ greater than 50 metres in length

W

W

W

ie vessel under way under power, looking at starboard aspect greater than 50m

W
W
W

R

-help!

W

R

on masthead, white over red, same as H Flag (pilot) indicates pilot vessel

This white light doubles as power light (indicates vessel under power)

Yellow over white - fishing - Red over white - not trawling
Green over white - trawling

Red
White
Red

Green lights



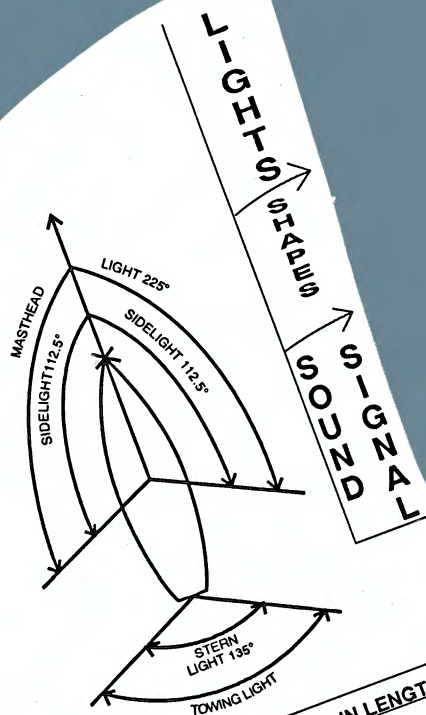
NOTES



NOTES







VESSELS 50 METRES OR MORE IN LENGTH
 Masthead - 6 MILES
 Sternlight - Sidelights - Towing Light 3 MILES

VESSEL 50 METRES - 12 METRES
 Masthead 5 MILES. } VESSELS LESS THAN 20 METRES
 3 MILES

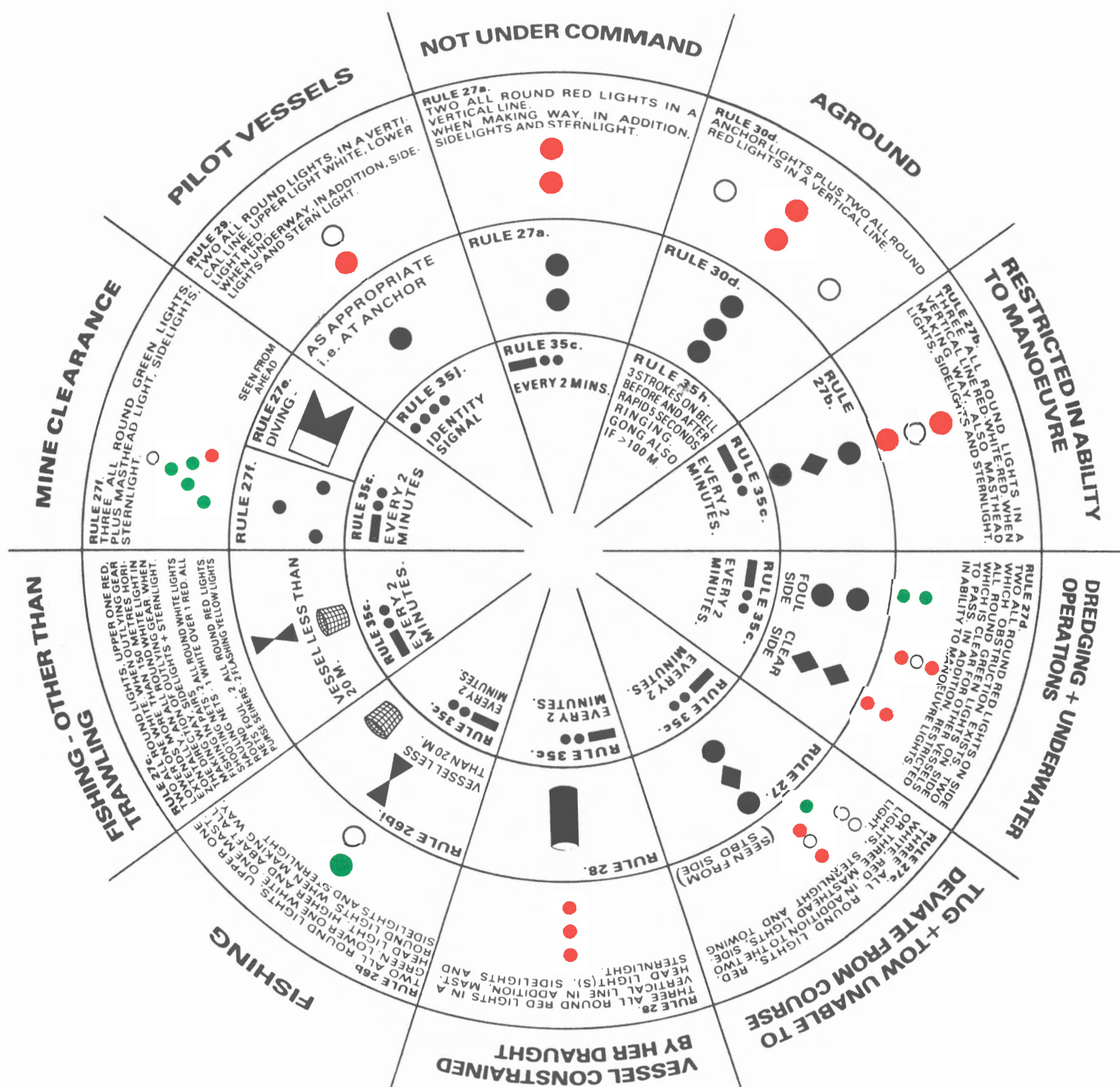
Sidelights - Sternlight - Towing Light - 2 MILES

VESSELS LESS THAN 12 METRES IN LENGTH
 Masthead 2 MILES
 Sidelights 1 MILE
 Sternlight - 2 MILES
 Towing Light - 2 MILES

- I AM ALTERING MY COURSE TO STARBOARD
- I AM ALTERING MY COURSE TO PORT
- I AM OPERATING ASTERN PROPULSION

PROLONGED BLAST - BLAST OF 4 TO 6 SECONDS DURATION
 SHORT BLAST - BLAST OF 1 SECOND DURATION

- I INTEND TO OVERTAKE YOU ON YOUR PORT SIDE
- I INTEND TO OVERTAKE YOU ON YOUR STARBOARD SIDE
- ACKNOWLEDGEMENT SIGNAL FOR ABOVE



DISTANCE CONVERSION TABLE. METRES - FEET (APPROX.)	
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12	40
20	66
25	82
50	164
100	328
150	492
200	656
1000	3280

LIGHTS
SIGNALS
SOUND SIGNAL

- A.) A GUN OR OTHER EXPLOSIVE SIGNAL FIRED AT INTERVALS OF ABOUT A MINUTE.
 B.) A CONTINUOUS SOUNDING WITH ANY FOG SIGNALING APPARATUS.
 C.) ROCKETS OR SHELLS THROWING RED STARS FIRED ONE AT A TIME AT SHORT INTERVALS.
 D.) S.O.S. MORSE CODE ●●●■■■■●●●●●●
 E.) SPOKEN WORD MAYDAY.
 F.) CODE FLAGS N.C.
 G.) SQUARE FLAG WITH BALL ABOVE OR BELOW.
 H.) FLAMES ON A VESSEL (FROM TARI/OIL BARREL).
 I.) ROCKET PARACHUTE FLARE OR HAND FLARE SHOWING A RED LIGHT.
 J.) SMOKE SIGNAL GIVING OFF ORANGE SMOKE.
 K.) SLOWLY RAISING AND LOWERING ARMS.
 L.) RADIOTELEGRAPH ALARM SIGNAL.
 M.) RADIOTELEPHONE ALARM SIGNAL.
 N.) SIGNALS TRANSMITTED BY EMERGENCY POSITION INDICATING RADIO BEACONS.

INTERNATIONAL CODE OF SIGNALS, MERCHANT SHIP S.A.R. MANUAL
 1. PIECE OF ORANGE COLOURED CANVAS WITH EITHER A BLACK SQUARE OR CIRCLE OR OTHER APPROPRIATE SYMBOL.
 (FOR IDENTIFICATION FROM THE AIR).
 2. A DYE MARKER.

